THE JOURNAL

OF THE

Department of Agriculture

OF SOUTH AUSTRALIA.

No. 7. FEBRUARY, 1917. Vol. XX.

Published Monthly by the Department of Agriculture.

Edited by H. J. Finnis.

CONTENTS.

All communications to be addressed:

"The Editor, Journal of Agriculture, Victoria Square, Adelaide"

POINTS FOR PRODUCERS.

Agricultural Bureau Conferences.

Arrangements are now being made for the 1917 Conferences of several of the Agricultural Bureau districts. The first to take place will be the gathering of representatives of the Upper Eyre's Peninsula Branches, at Cowell, on Tuesday, February 27th. Local arrangements, which are in the hands of the Elbow Hill Branch (of which Mr. H. J. Wheeler is hon. secretary), have been practically finalised.

This Conference will be followed by the Lower Northern Branches meeting, which is to take place at Lyndoch on Friday, March 2nd. In addition to the usual programme, the hon. secretary (Mr. J. S. Hammat) advises, the Lyndoch and Rosenthal Branches are conjointly undertaking the staging of a display of the products of the district.

The Middle Northern Branches will also meet in conference during the month, the date being Wednesday, March 7th. Local arrangements are being undertaken by Mr. R. J. Rose.

Berseem.

Berseem is an excellent winter grower and a crop that makes headway when even oats and barley are dormant. As a greenfeed for poultry it is unexcelled, and all livestock take to it readily. It must be considered as a crop to be irrigated. Seed, which should be distributed at the rate of 20lbs. to 30lbs. per acre, should be sown in March, or at the latest during the first fortnight in April. It should be watered immediately to ensure prompt germination, and the first cut should be taken as soon as the growth is sufficient to permit of this. Subsequent cuts should be as frequent as possible, and in order to ensure best results, an irrigation should follow each cutting. At seeding a dressing of superphosphate should be applied, and the addition of farmyard manure to the crop will do no harm. Seed can be obtained from the Department of Agriculture, the price being 10d. per lb. (cartage and railage extra).

Horses and Wheat.

The necessity for exercising the utmost care in keeping horses away from wheat has been frequently referred to, but despite these warnings, cases of wheat engorgement are reported from time to time. Prevention is cheaper and more effective than treatment. Where treatment is necessary, however, the Veterinary Lecturer recommends drenching the affected animals with ¼lb. of baking soda in a quart of warm milk; backraking, and giving the animals large enemas of warm soapy water. They should be encouraged to drink as much and often as they will, and they should be given no food until the wheat is passing freely. Plenty of brisk exercise will very materially help, and bleeding at the neck vein will likewise assist. Foundered feet should be soaked continually with either hot or cold water swab, the body and legs should be groomed well three times a day, and the distended flanks rubbed briskly at frequent intervals.

Influence of Method of Thrashing on Seed Corn.

It has been observed that seed from grain thrashed by machine is not so good as that obtained by the old method of the flail. With the object of ascertaining the influence of the method of thrashing in the quality of grain intended for seed, Professor Burke, Director of an important Agricultural Institute in Switzerland, is reported in the *Mark Lane Express* to have carried out a set of investigations with wheat, rye, and barley. In the first place, the proportion of grain broken or bruised in the operation was calculated and found to be 3 per cent. with the thrashing machine and 1 per cent. with the flail. The grain was then subjected to experiments to test its germinating power. The flail seed produced 92 per cent. of plants, while the machine seed only gave 88 per cent., and of these 10 per cent. grew badly in consequence of the injury received during the thrashing operation. When the seeds were subjected to the action of sulphate of copper to render them less susceptible to attacks of plant disease, the difference was still more marked. The machine seed, in consequence of a large proportion of broken skins, was found to be very sensitive to the action of the acid, and in such cases its life-germ was probably injured; at any rate with the machine seed the loss of germination following the treatment with the chemical was 8 per cent., against 3 per cent. with the flail seed. It was also noticed that the largest grains—which would have produced the best plants—suffered most, and thus tended to deteriorate the crop in another way; in fact, in the long run it might lead to a degeneration of the species. As a result of his experiments the professor recommends that grain intended for seed should be thrashed lightly with the old-fashioned flail. This is a point that appears to be worth consideration.

Imports and Exports of Plants, Fruits, &c.

During the month of November, 1916, 1,777bush. of fresh fruits, 12,274bush. of bananas, 11,012 bags of potatoes, 257 bags of onions, 645 packages of other vegetables, 42 packages of plants, seeds, and bulbs, 112 empty bags (60 fumigated), 789 empty casks, and 107 empty cases were examined and admitted at Adelaide and Port Adelaide under the "Vine, Fruit, and Vegetable Protection Acts of 1885 and 1910"; 154bush. of bananas (over ripe) were destroyed. Under the Federal Commerce Act 50 cases of fresh fruit, 13,757 packages of dried fruit, 710 packages of preserved fruit, and 4 packages of vegetables were exported to oversea markets. These were consigned as follows:—For London, 680 packages jam, 11,768 packages of dried fruit; for New Zealand, 370 packages of dried fruit and 50 packages of citrus fruit; for Busra, 18 packages of preserved fruit, 49 packages of dried fruit, 4 packages of vegetables, and 12 packages of jam; for Vancouver, 1,550 packages of dried fruit. Under the Federal Quarantine Act 707 packages of plants, trees, bulbs, &c., were examined and admitted from oversea sources, and 4 bags of cumin seed were detained on account of adulteration with fennel seed, &c.

INQUIRY DEPARTMENT.

Any questions relating to methods of agriculture, horticulture, viticulture, dairying, &c., diseases of stock and poultry, insect and fungoid pests, the export of produce, and similar subjects, will be referred to the Government experts, and replies will be published in these pages for the benefit of producers generally. The name and address of the inquirer must accompany each question. Inquiries received from the question-boxes established by Branches of the Agricultural Bureau will be similarly dealt with. All correspondence should be addressed to "The Editor, *The Journal of Agriculture*, Adelaide."

VETERINARY INQUIRIES.

[Replies supplied by Mr. F. E. PLACE, B.V.Sc., M.R.C.V.S., Veterinary Lecturer.]

[Extraordinary pressure on space has rendered it necessary to very considerably curtail the inquiry department. Replies to those questions of more general interest only have been published; however, every query received has been replied to through the post.—ED.]

"E.C.M.," Parrakie, seeks treatment for pigs affected with long round worms.

Reply—Known as *Ascaris suis*. Feed cinders or charcoal regularly, and give a teaspoon of sulphur and saltpetre once a day in feed for a week. If this does not clear them give an ounce of crushed castor oil beans to each pig once a day for a few days. The drugs can be obtained through any store.

"Anxious," Nadda, has horse, five years, off pasture, has swelling on side of nose, and bleeds at nostril.

Reply—The trouble is very likely a grass seed abscess. Hurry him a little to make the veins stand out on his face, and if no big one crosses the swelling lance it and then dress with spirit of iodine.

"Anxious," Nadda, reports that pigs went suddenly mad and rushed out of sty; were found three days later all right.

Reply—Though the age is not given it may be supposed the pigs were young. The attack was an epileptic fit, due to teething and worms most likely. The regular feeding of cinders or charcoal will prevent a repetition.

"P.N.," Clanfield, has a mare, 13 years, which takes food in big mouthfuls, and spits it out again; unable to swallow.

Reply—Although the throat and teeth seem all right, the symptoms point to irregularity of the last molars, and it would be well to carefully examine them with a gag in the mouth. Grass seed abscesses in the gullet, or worm abscesses in the stomach also produce similar symptoms. Give her a handful of boiled linseed in her drinking water twice a day and a teaspoon of baking soda in her feed also for a week or two, and kindly report result of further examination.

"N. K.," Leighton, asks for a tonic for horses.

Reply—Sulphate of iron can be given in any sort of trough, galvanized or otherwise. Well-kept horses should not require a tonic as a regular thing, but if worms etc. are suspected a course of a week or two will do good. The dose is 1 to 2 drachms daily per horse, which can be powdered and fed with greater regularity than when put in drinking water; 1lb. to 7lbs. per 1,000galls. is the usual mixture Rusty iron in the trough provides a more readily absorbed form of iron, as it is constantly being oxidised by the action of the water.

"F. H. G. P.," Frances, reports lambs troubled with scabby mouths and feet.

Reply—The condition, known as stomatitis, has been rather prevalent in the South-East this year, but will readily yield to a dressing by rubbing a bit of moistened bluestone on the places and dabbing Stockholm tar afterward, for the feet a bit of rope dipped in tar can be run through the claws.

"R. F. M.," Taplan, has cows troubled with indigestion.

Reply—Barley stubble is somewhat dangerous to cows that have not been used to it, but if they are let on to it when they have had a good feed of softer stuff then they may remain on for an hour or two quite safely and day by day the time can be lengthened, but they should be watched, and if any become constipated it would be well to give an opening drench such as molasses.

"L. E.," Naturi, reports horses troubled with cough, nasal discharge, short breath.

Reply—The symptoms point to a form of pneumonia brought about by blood parasites, and common in your part. Rest is an essential part of the treatment, and if it cannot be given some deaths are likely to occur. Treatment—Damp food, and give a big proportion of bran. A teaspoon of saltpetre in feed every evening, and twice a day a tablespoon of tincture arsenicum for a week, a little Stockholm tar on the tongue each morning, and to the most obstinate ones 20 drops tincture aconite every night.

"J. H. J.," Inman Valley, seeks information in regard to milk fever.

Reply—Milking a cow dry during the first 24 hours after calving is very likely to bring about an attack of milk fever in a susceptible animal; it is better to leave the milking to the calf. For fuller detail see "Milk Fever," in the *Journal*, October last.

"J. M.," Wildcloo, had a filly, two years, running in paddock of green and dry feed, found swelled up and breathing hard; could not swallow drenches; died, and was found with much distended stomach.

Reply—The symptoms point to acute fermentative indigestion. In a similar case if ammonia of any sort is handy give a teaspoon with a little honey on the tongue and repeat every 20 minutes if necessary. If ammonia is not to hand give ginger, pepper, mustard, and a dessertspoonful of baking soda, either as a drench with water, or better as a ball with honey or flour.

Kanmantoo Agricultural Bureau report that a cow, five months in milk, is going dry.

Reply—At eight years a cow that goes dry in this way is not very likely to resume lactation. Ten drops tincture phytolacca morning and evening for three weeks might improve matters somewhat. It may be mixed with a spoonful of honey and smeared on the mouth.

"J. C. H.," Butler, has mare and pony; mare went stiff and died; pony seems to be going the same way.

Reply—The trouble is a poisoning of the blood cells by parasites and their excreta, these are conveyed to the system very often by means of flies. Treatment—Two tablespoonfuls of Fowler's solution of arsenic once a day for three weeks, a teaspoonful of sulphate of quinine twice a day for 10 days, green feed and regulation of bowels by 2ozs. Epsom salts twice daily if necessary.

"A. D.," Keith, has a cow with teat cut by wire; milk runs away.

Reply—Wrap ordinary sticking plaster round the teat and varnish over. Do not milk the quarter out, only relieve it as little as possible, and it will soon dry off.

"A. D.," Keith, also reports that in the case of gelding, aged, swelling of sheath commenced some months ago by sores on penis, and continues in spite of antiseptic treatment.

Reply—The hard lumps will be found to be fibrous and possibly contain gritty nodules; they are caused by worms known as *habronemata*, and these are inoculated into the system through the sores noticed by flies. It would be well to cast the horse and dissect out the lumps and treat the operation wound with spirit of iodine. It is not likely that the swelling will entirely disappear, but it may be much reduced.

"C. J. P. D.," Penola, has lambs with scabby lips and hoofs, some scummy eyed.

Reply—The scabby lips and hoofs are known as stomatitis, or cuckoo scab, and have been very prevalent in the South-East this year. They are produced by a parasite, and yield to sulphate of copper dusted on and followed by Stockholm tar for both lips and hoofs. The powder mentioned, viz., 1 carb. ammonia to 7 boric acid, will suit the eyes if dusted in occasionally. It should be kept in an airtight tin.

"J. W. M.," Halidon, reports that a sow fell while at play, and has lost use of hind quarters.

Reply—This sudden paralysis often occurs on account of worms. Rub her back with liniment daily and give 10 drops tr. nux vomica three times a day for a week, also let her have a dessertspoonful of a mixture of equal parts of saltpetre, sulphur, and charcoal in her food twice a day.

"F. G. B.," Pinnaroo, has a colt 4½ months old; supposed kicked near hind, but no mark; at first slightly lame for fortnight, then leg swelled above hock and under tail, swelling extended and very hard, hair coming off, great pain, lies mostly. Owner has seen many horses kicked, but never one with these symptoms.

Reply—The symptoms all point to that form of blood poisoning known as pyelitis and other names, or as joint ill, often referred to in these replies. The colt will probably anticipate the shooting by dying, but if not, the swelling should be lanced at its softest part and dressed twice daily with a solution of 20grs. acetozone in ½ pint of water, and two tablespoons of the same solution should be given by mouth three times a day.

STRAWBERRIES FAILING TO FRUIT.

The non-fruiting of strawberries may usually be attributed to one of two causes, said the Horticultural Instructor, Mr. Geo. Quinn, in reply to a correspondent. 1. The plants may have been kept growing too strongly, particularly by the use of excessive water applied to richly-manured land. They will then make much foliage and runners, and a few flowers which seldom set. By way of remedy, do not force the plants, and keep the runners cut away from fruiting beds. In summer give just enough water to keep the plants alive, and then if early rains do not fall in March, apply more water, with a light dusting of superphosphate hoed in around each plant, taking care not to hoe deeply close to the plants, or valuable roots will be severed. 2. The second cause of non-setting may be due to lack of pollination taking place during the blooming period. Some kinds of strawberries bear very impotent pollen, others do not ripen the pollen sacks to synchronise with the susceptible stage of the pistils, whilst a third section bring only their pistilate, or female organs of the flower, to a perfect stage. Without seeing the blossoms or knowing the names of the sorts in question, one cannot advise on this phase. From the fact that the plants in question bore some fruits in the early stages of their lifetime, it is most likely the first supposition of the cause of non-fruitfulness is the more correct of the two.

SOME DISEASES OF WHEAT CROPS AND THEIR TREATMENTS.

[An Address delivered by the Superintendent of Experiments, Mr. W. J. SPAFFORD.]

INTRODUCTION.

This subject—"Diseases of Wheat Crops and their Treatments"—is much too large a one to deal with in any way but briefly in a single address, as every individual disease would take a considerable time to discuss in detail. This being so, I will endeavor to treat the more important ones fairly fully; but those which at present do not cause much damage will be discussed but briefly. Most of what are usually spoken of as "diseases" of wheat are generally recognised nowadays as being caused by parasitic fungi or extremely small plants that live on the wheat plants, developing and reproducing themselves at the expense of the wheat plants. Although these diseases are understood by many, there are still a large number of wheatgrowers that are very ill-informed as to their exact nature; some very peculiar views are still held regarding these parasites, and there are still men who are no further advanced than were the ancients in considering them the work of an offended god or of an evil spirit. These antiquated ideas must be abandoned and a correct view taken of the nature of each disease before we can hope to successfully check or eradicate it.

FUNGUS DISEASES.

The main point to be grasped and remembered in connection with these diseases is that all of them causing loss in the wheat fields are plants living on the wheat plants, using some of the sap that should have helped to develop the crop, for their own development and reproduction. The individual plants of these disease fungi are so small that they must be seen under a microscope before they can be distinguished as plants, and so it is easy to realise why there are still men who do not understand what the diseases are. If they were proportionately as large as is the mistletoe, so common on our gum trees, or the dodder on lucerne, everyone would know that they were plants living on the wheat; but because they cannot be recognised as plants by the naked eye does not alter the fact. What they lack in size they make up in numbers, which fact will be readily comprehended by wheatgrowers who have seen red rust or takeall prevent a crop reaching maturity, and who have noticed what a large amount of the

conspicuous plant parasite, mistletoe, must be growing on a gum tree to check its development.

Once we have digested the fact that these diseases of wheat are parasitic plants we must then study the life history of each individual disease if we hope to discover means of prevention or eradication.

SMUTS (*Ustilagineae*).

These fungus diseases of wheat—the smuts—do more damage tc our crops than any other of the fungus diseases, and year in and yea out possibly more than all the others put together, and they are th only diseases that do damage to the wheat crops every year in every district where this crop is grown. Indeed one of this group of disease (bunt or stinking smut) is so bad that, if care is not taken wit the seed, up to 50 per cent. of the crop might be affected, and as suc lost.

These smuts as a class are charactêrised by producing masses o dark brownish-black spores in certain portions of the wheat plant These spores, which are equivalent to the seeds of the higher plants germinate at the same time as the wheat by sending out slende mycelium threads which enter the young and tender wheat plan through its pores, glide between the cells, and grow up with it. Late on these mycelium threads join together in some part of the plant-in most cases in the ear—and produce branches which bear th spores already referred to as the masses of dark brownish-blac powder.

BUNT OR STINKING SMUT (*Tilletia tritici*).

Of the smuts, bunt is by far the worst that South Australian farme have to contend with. With this fungus the fertile branches are pr duced in the ear of the wheat plant, and the spores are formed insi the skin which in ordinary circumstances would have enveloped t wheat grain. This collection of spores, covered by a skin as it is, known as a bunt ball, or smut ball, and consists of a mass of ev smelling dark-brownish powder, from which fact arises its nam stinking smut. The damage done by the disease is the reduction yield through the grain being replaced by the spores, and the le sened value of the grain for milling purposes, because the offensi odor and dark color of the spores spoils both the color and odor the flour made from affected wheat.

INFECTION OF WHEAT CROPS BY BUNT.

As the collections of spores are contained in the skins of the whe grains, and these are held by the glumes or chaff of the wheat hea exactly as if they were sound grains, the diseased heads are harvest with the healthy ones and the spores of the bunt are mixed with t

good grain at harvest time; any of this grain used for seed is already infected by the disease, and given ordinary seeding conditions the resulting crop will be diseased. This is the main infection for bunt; indeed the infection of the seed is the only one of any account in ordinary practice, and if not brought about through the crop being "bunty" it is often done by using machines already covered with spores, or putting the grain for seed into bags that had previously held "bunty" grain.

Preventive Treatment for Bunt.

The life history of the bunt plant shows us three periods in its life when it might be possible to kill it and so prevent injury to the wheat plant, namely:—(1) After the spores have germinated and before the mycelium threads have entered the young plant; (2) while the wheat plant and the bunt plant are growing up together; and (3) when the spores are on the wheat grains to be used for seed.

(1) After the germination of the bunt spores and before the mycelium threads have entered the young wheat plant there will possibly be found some way to kill the threads of the bunt; but at present nothing can be safely used at a reasonable cost to prevent the wheat plants from being infected in the soil. We sometimes see happen in the soil what we would like to reproduce cheaply; when the seed is sown in soil that is quite dry as far as we can see, we often get clean crops of grain from untreated bunty seed. This is because there is enough moisture in the soil to germinate the bunt spores, but not enough to start the grain, with the result that there is no host plant for the threads of the fungus to enter, and so it dies.

(2) The first parts of the mycelium threads to enter the young wheat plants die as the wheat gets well above ground, so that most of the threads in a diseased plant are near to the top of the plant and none below the ground nor near it; this being so it might be possible to clear a crop from the trouble at this stage. Professor Perkins, when Principal of Roseworthy Agricultural College, thought so some years ago, and had experiments conducted with this in view. Here he had plants grown from artificially infected seed, cut off as close to the ground as possible at various stages in their growth, hoping that the mycelium threads died sufficiently early to be able to free the plants from the disease and still have time for the crops to develop properly. The crops were certainly freed from the fungus, but the cutting off had to be left so late that in a district like Roseworthy there were few springs moist enough to make a full crop after such a late cutting; this, so far as feeding off the crop was concerned, settled all chances of it being effective in any of our "early" districts.

(3) The task of finding a preventive treatment for this disease when the spores are on the seed is much simpler than in the other two cases; here what we have to find is something that will cheaply prevent the bunt spores from germinating without injuring the wheat seed. A number of methods of doing this have been discovered, chief amongst which are the use of heat and the application of fungus-killing liquids. The surest method of completely killing all bunt spores and not injuring the grain in the least degree is the heating treatment, usually done by the use of hot water. This treatment consists in dipping the bags of grain in water at a temperature of from 130 degrees F. to 134 degrees F., and leaving it at that temperature for 10 minutes to 15 minutes. This is an excellent theoretical method of treatment, but there are very few farms that have the conveniences necessary to keep water within this very limited range of temperatures—below 130 degrees F. will not kill the spores and above 134 degrees F. will kill the wheat. Next to the hot water treatment comes the use of a solution of copper sulphate or bluestone, which if intelligently handled is very efficacious. The reason I give it second place is because it is a very cheap method, generally understood by the farmers of this State; the material itself is so cheap that it is seldom adulterated, and if adulterated it is easily recognised as such.

This treatment of seed with a solution of copper sulphate to be effective in the killing of the bunt without injuring the grain rests mainly on the two following points:—(*a*) The strength of the solution in water, and (*b*) the thorough wetting of all the grain. (*a*) The solution should be at least what is known as a 1 per cent. solution, and not more than a 1½ per cent. solution, except in very exceptional cases. These strengths are represented by 1lb. of copper sulphate in 10galls. of water for a 1 per cent. solution, and 1½lbs. copper sulphate in 10galls. of water for a 1½ per cent. solution; 1 per cent. is strong enough if the seed to be pickled is not very badly infected, 1½ per cent. makes it a little surer, but is unnecessarily strong in anything but bad cases, and over 1½ per cent. certainly kills all the bunt, but also reduces the germinating powers of the grain rather considerably. (*b*) To thoroughly wet the grain with the solution some method must be used that rubs the grains well together; if this is not done air bubbles remain on the surfaces of the grains and many spores of the fungus could nestle under these and never become wet. This can be illustrated by dropping a handful of grain into a bottle containing some solution, when the air bubbles on grains are easily seen, and if the grain be left in the bottle for a week the bubbles will be found to remain intact. That each of these air bubbles might cover a lot of the spores is easily recognised if you remember that the spores

are microscopic, and so small that it takes from between 2,000 and 3,000 of them placed alongside one another to extend 1in. The best method of rubbing these grains together so as to break these air bubbles is by using a shovel to turn a heap of loose wheat on a floor after pouring the requisite amount of solution on to the heap; this method will necessitate the use of about 2½galls. of solution to a bag of seed, and should be turned over from three to five times. Where no suitable floor is available the next best method of pickling with a copper sulphate solution is to put about 1bush. of seed in a bag, tie loosely, and immerse the bag in the solution for five minutes or so. There are a number of pickling machines on the market, most of which rely largely on the fact that all unbroken bunt-balls and other light material floats on the surface of the liquid and can be skimmed off. This is certainly a great advantage when the seed is dirty and badly "bunted," but it is only one part of the operation, and really not as important as rubbing the grains together to get them thoroughly wet. Seed that has been pickled with a bluestone solution can be left almost indefinitely before sowing, provided that it is thoroughly dried before being rebagged. Indeed the germination of pickled seed that has been allowed to dry and kept for some time is usually greater than if the seed is sown soon after pickling.

Another liquid used fairly largely in Australia as a preventive to bunt is formalin. This to be effective should be at least a ¼ per cent. solution, *i.e.*, 1lb. of commercial formalin in 40galls. of water. When this substance has been used the grain should be sown when still damp immediately after pickling; if allowed to dry it should not be sown for at least a fortnight, or if it becomes necessary to use the seed before that time is up it should be thoroughly wetted with water. Once grain pickled with formalin has become dry its germinating power gets less for a week, but after that time it gradually improves until one month after treatment. Formalin is a solution of a colorless gas in water, so that it is easily adulterated. In commercial formalin this should be a 40 per cent. solution of formaldehyde gas in water, but some formalin supplied to farmers at Nhill one year on analysis only showed 20 per cent. formaldehyde. Formalin is an effective pickle when guaranteed material is used and when ordinary care is taken, but because of its liability to adulteration and the need of immediately sowing the grain, bluestone at the present is the more reliable of the two.

2. Loose Smut (*Ustilago tritici*).

This loose smut is fairly common in our wheat crops, but fortunately does but very little damage. The fertile branches of this smut

are produced in the ear of the wheat plant, like it is with bunt, but in this case instead of the spores being formed only inside of the grain, the whole of the head except the stalks is replaced by spores of the fungus.

The damage done by the disease is reduced yield through some of the heads which should have carried grain being completely destroyed.

Infection of Wheat Crops by Loose Smut.

Plants affected by loose smut, instead of pushing out from the "sheath" sound heads of wheat as is the case with healthy plants, send out masses of blackish powdery spores. This powder soon dries on exposure, and is blown off the stalks, leaving only the rachis or central stem of head, like a skeleton amongst the good heads. These spores are carried by wind to the healthy plants alongside, which are flowering at this time, and should any of these spores find their way into flowers of the wheat they germinate, penetrate the ovary and go at once into a resting stage. The grain resulting from this ovary continues its normal development, and to all outward appearances is a normal grain, but is internally affected by the disease. If such a grain is planted the following season the resulting plant will be affected by loose smut.

Preventive Treatment for Loose Smut.

As has already been pointed out, this disease at present does but little damage to our wheat crops, but it appears to be on the increase in some countries, and might possibly get severe enough here to need some treatment. Unfortunately the treatments for the prevention of bunt have no effect on loose smut, and a special form of treatment is necessary. L. E. Melchers, Plant Pathologist of Kansas Agricultural Experimental Station, U.S.A., recommends the following treatment, and calls it the "long-time hot-water treatment":—The seed is placed in sacks and dipped in water at a temperature of 110deg. to 115deg. Fahr., and allowed to remain in the water within this range of temperature for three hours with frequent agitation. After this time the seed is removed and spread out to dry.

3. Flag Smut (*Urocystis tritici*).

This is often incorrectly known as black rust, but is essentially a smut, and not a rust. Here the fertile branches are produced in the leaves and sheath of the wheat plant, and the disease is characterised by the appearance on the leaves of long, bluish-black lines, more or less parallel to one another, and the leaves become very much twisted and curled. These lines contain a black powder, which, to the naked eye is very similar to the other smuts. The disease usually appears

when the plants are young, and generally keeps them so weak that they are unable to produce heads. The damage done is often fairly great in this State, but the cause of the reduced yield is not always recognised until pointed out, as the diseased plants have broken down by harvest time, and are not readily seen unless particularly looked for. This damage is solely reduced yield through the disease preventing the plants from producing grain.

Infection of Wheat Crops by Flag Smut.

As this fungus disease affects the leaves of the young wheat plant and rarely allows it to come into ear the chances are that infection comes in every case through the medium of the soil by spores dropping into the earth and by the affected stalks and leaves being ploughed in at fallowing time. And as these spores will pass through animals and remain alive, infection will come from the manure of animals eating affected straw or chaff.

Preventive Treatment for Flag Smut.

Where this disease is found to be present to any great extent the first operation of a preventive nature should be the burning of the stubble. This will directly destroy a very large number of the spores, and will leave the land so free from rubbish that good, close fallow should result. Fields affected should be fallowed as early as possible, which will possibly lead to the germination of the fungus spores, and they will die for the want of a host plant.

Fields affected should not be sown early, indeed they should not be sown until some time after the first autumn rains, for it has been found that wheat sown early is always affected to a greater extent than that sown late in the same field. Change of crop must be practised in places where the disease has appeared, as the growing of wheat after wheat encourages the disease.

Some varieties are more liable to attacks than others, so resistant ones should always be chosen when once this fungus has been noticed.

Fungus Diseases other than Smuts.

The smuts are the parasitic fungi that do most damage to our wheat crops, but they are by no means the only group of fungus diseases with which we have to contend. The most important of these from the point of view of damage done over a period of years are:—4. Takeall (*Ophiobolus graminis*). 5. Red rust (*Puccinia graminis*). 6. Wheat mildew (*Erysiphe graminis*).

4. Takeall (*Ophiobolus graminis*).

This disease is becoming increasingly troublesome to wheatgrowers in many of the farming districts of the State, but as it becomes better

understood its ill effects will be very considerably reduced. The disease is a fungus growth living on and so affecting the young wheat plants, and should rather be known as wheat stem killer than takeall, as it mainly affects the bases of the stems of the wheat plant, and when present to any great extent is so severe on the plants that they only grow a few inches high before dying back. In the field it affects patches of the wheat crops, and can be recognised by the affected patches being more or less circular in shape with their centres quite bare, and the plants in the diseased circle gradually improving until the healthy plants on the edge of the ring are reached. The affected plants are usually easily recognised by the fact that the bottom two inches or so of the stems is more or less covered with a brownish powder. This latter means of recognition is of importance to the farmer, as the affection of wheat with which this disease is most often confounded is the result of climatic action, and usually spoken of in this State as the "blighting off" of the wheat crop. At one time, and to a lesser extent at present, everything that resulted in the dying back of the wheat crop was known as takeall, but we are gradually growing away from this error. The "blighting off" of wheat crops is more or less common in some seasons in some districts, and is characterised by the dying right back of individual plants and patches of plants in strong, luxuriant crops, and is caused by the moisture being dried out of strong sappy plants, through some climatic cause, quicker than the roots can make it good from the soil. If "blighted" plants be examined they will be found to have dried right down to the soil a clear shiny yellowish all the way, whereas as was already pointed out, plants affected with takeall are covered with a brownish powder or stained brown.

It has been the experience of most farmers, especially in low rainfall areas, that once a field has been affected with takeall if wheat be grown there as the next crop, even on fallow, it will be affected by the disease, and very possibly have a worse attack than the previous crop. Also that unless something be done to check the disease wheat growing will have to be given up on that particular land for a time, and some other crop grown.

Life History of Takeall.

The spores of the fungus germinate by sending out long mycelium threads, which are the vegetative portion of the disease. These threads form masses which have a different appearance depending on their position on the plant. On the roots there are numerous dark-brown threads interlacing and spreading upwards, and it appears that the fungus spreads from one root to others by these threads. The mass of mycelium threads between the sheath and stem is termed plate myc-

lium, and is a continuation of the threads from the roots. This mass peels off in flakes when dry, and may possibly infect crops the following year. Then also between sheath and stem there is to be found a collection of light-brown strands joined together to form a broad band which passes upwards.

These mycelium threads draw nourishment from the wheat plants, and finally produce their fruiting portions or spore cases. The spore cases formed are flask-shaped bodies, having their swollen ends immersed in the tissues of the plant, and their necks, which are usually slightly curved, projecting from the surface; these may occur either on the roots or sheaths. Inside each spore case are numerous sacs or asci, each of which contains eight spores; so a single spore case contains an immense number of spores. When the spore cases mature the little sacs are expelled one after the other, and the spores are set free.

The spores are elongated, slender bodies divided into compartments by cross partitions.

Infection of Wheat Crops by Takeall.

As this parasitic fungus lives on the base of the stems and roots of the wheat plant, and as the badly affected plants do not produce heads of grain, the chances are that the grain harvested from affected crops and used for seed the following year is not infected with the spores of the disease. The infection of the crops is most likely brought about in the soil, more particularly from the stems of the plants that are buried when the soil is being ploughed.

Preventive Treatment for Takeall.

(1) As the straw left after harvesting an affected wheat crop is the most likely means of infection, the first step in the eradication of the disease should be the burning of the stubble. This will actually burn much affected material, and in places at least will kill many spores on the underground stems and roots by the heat generated.

(2) As the fungus has been found on many of the plants that are usually found growing on our wheat lands, properly working the fallows, keeping them free from all weeds will tend to reduce the disease.

(3) One crop that will grow more or less well wherever wheat can be grown well—the oat crop—is but seldom, and then never badly, affected by this disease. This being so, when wheat crops are affected, the disease can be checked on that land by the growing of oats instead of wheat for a few seasons, especially if this is done on well-worked fallow land. The oats not being readily attacked by the fungus tend to starve it out of the land.

(4) Until the fungus causing the trouble was isolated a few years ago, it was usual, in this State at any rate, to consider the disease as being a mechanical one. It is not long ago that a common saying amongst farmers was, "Late fallow brings takeall," and also, "Ploughing in a lot of straw or rubbish brings takeall." These two things—late fallow and ploughing in much straw—certainly appear to encourage the disease, so much so that I personally believe that the holding of the disease in check depends more on the mechanical condition of the soil than on anything.

The first method given of checking the disease—the burning of affected straw—does away with the second part of mechanical fault encouraging the disease, *i.e.*, the ploughing in of much rubbish. This burning of our straw is wrong in any system of farming, and more particularly so under a system like ours, where we burn up the organic matter very quickly by bare fallowing the land; and it should only be done after the land is properly cleared of its natural growth, when the takeall disease has been prevalent. When the disease has been checked the waste of organic matter due to burning should be made up by being extra careful to get as much as possible into the soil.

The reason that late fallow and ploughing in much straw encourages the takeall disease appears to rest on the fact that in most seasons they do not tend towards soil conditions ideally favorable to the growth of wheat, particularly when the wheat is in its earlier stages, when the disease is most active. From studying the disease for some years now I am convinced of the fact that even in soil more or less badly infected with this disease, if the wheat crop gets a really good start and continues in good healthy growth there will be hardly any evidence of the trouble. This healthy growth depends very largely on the soil being in a state of good mechanical condition, and late fallow and much dry organic matter in the soil, as a rule by no means give mechanical condition good enough to promote this growth. In its simplest form the ideal seed bed for wheat consists of soil that has been ploughed up and then so worked that only the immediate surface 2in. to 3in. is loose, and the soil immediately under it firmly compacted together. It is in a seed bed such as this that wheat will give its best yields, other things being equal, and I feel quite convinced that if seed beds like that described were always attained we would hardly know what takeall is. In the ordinary operations of bare fallowing, obtaining this seed bed is one of our main objects, even if it is done in most cases unconsciously; and if the land is ploughed early, the rains that fall compact the under surface by running the particles together, and we cultivate the surface of the land to keep it free from strong crusts and from weeds.

These operations get us somewhere near the ideal seed bed. But in the case of late fallow the ploughing is usually done after the heavy rains of the year are finished, and so not enough rains fall throughout the time between ploughing and seeding to compact the under surface soil. This leaves the soil, as it also does when a large bulk of organic matter is ploughed in, with more or less large spaces in the under layers, which when the roots of the wheat plants reach them naturally give a check to the growth of the plants; and, unfortunately, to make it worse, this check to the plants comes just at the time when the fungus is most active and when the wheat plants are weakest. In all land that is cleared, *i.e.*, free from stumps, the producing of good mechanical condition of the soil or an ideal seedbed for wheat can be brought about by the use of land rollers. As this disease spreads the use of rollers is becoming more necessary, and instead of depending so much on the rains that fall after the seed is in the soil to compact it together, as is the common practice at present, rolling the land will become just as important and necessary an operation as is harrowing. In practically all seasons a heavy rolling of the land is advantageous, but it is an essential operation when heavy rains have not fallen on the fallowed land.

RED RUST (*Puccinia graminis*).

This disease is also a fungus parasite of wheat, but its life history is by no means as simple as is that of the smuts already dealt with. In Europe its life cycle is very complicated, and briefly is somewhat as follows:—

If we examine under the microscope the reddish powder to be found on the surface of the leaves of the wheat plant when the disease first makes its appearance, we will find them to consist of more or less oval cells on short stalks. These are the spores, and are known as uredospores; they will ripen in four or five days after they make their appearance, when they fall from their stalks and are blown from plant to plant. If there is sufficient moisture where they lodge, and if the weather conditions are warm enough, these spores germinate by sending out thin threads which grow along the surface of the plant until they reach breathing pores. They enter these breathing pores, and grow between the cells, pushing little suckers into the cells to extract their food from the wheat plant. When weather conditions are favorable—muggy weather, *i.e.*, damp warm weather—these uredospores only take a few days to reproduce themselves by thousands, and the spores formed germinate again, extract more nutriment from the plant, and repeat the process as long as the plant contains sap on which the fungus can live. This robbing of the sap of the wheat

plant impoverishes it, and if weather conditions are suitable to the rapid growth of the fungus, the plant is so badly affected that it just dries up instead of maturing grain.

When the sap has left the plant the patches of spores change their color from iron-rust red to a more or less black color, and we have the second stage in the life history of the fungus. These spores have not only changed their color, but also their nature; they are now double-celled, and without stalks, and are known as teleutospores; and as they do not germinate until the following spring they are also known as resting spores. These teleutospores germinate by giving rise to short, much-branched tubes, which in a very short while produce a very small spore on the end of each of the very short branches. Now these very small spores, instead of germinating on the wheat plant, do so on an ornamental shrub known as the barberry, which is rather common in Europe, and produce what are known as cluster-cups—bell-shaped depressions filled with spores—on the underside of the leaves. These spores in the cluster-cups on the barberry are known as aecidiospores, and it is these which germinate on the wheat plant, and in a few days give rise to the uredospores—the stage of the disease that does all the damage to wheat crops.

RED RUST IN AUSTRALIA.

The above life history of red rust is that recognised as correct for Europe, but the position in Australia is quite different, because we have no native barberries and comparatively few introduced ones. In any case no investigator has so far been able to get the rust of Australia to infect the barberry plants that are growing here, although many attempts to do so have been made; nor has any other kind of plant been found carrying the aecidiospores of the rust.

The teleutospores, or resting spores, *i.e.*, the blackish spores left on the flag and stem of the wheat after the grain is harvested, will not germinate and produce the minute spores or sporidiola until the following spring after they have had a rest. If these sporidiola would infect the wheat plant we would have no farther to look for the manner in which rust occurs whenever weather conditions are favorable, because there are always large quantities of these spores left about the whole of Australia where wheat is grown, particularly after a rusty season. But so far, however, no one has been able to prove that these minute spores produced by the growing teleutospore are capable of infecting wheat plants.

Indeed the manner in which the rust is carried over from season to season in Australia has yet to be discovered, and although much work has been done in this direction, nothing more than possible ways of

continuing through the summer and winter and then attacking wheat plants have been put forward. Mr. D. McAlpine in his *Rusts of Australia,* makes the following suggestions in this connection:—

The uredospores are produced in enormous numbers and are found in the air and on the soil. These may possibly carry the disease through and be blown about by the wind to crops at a great distance from the place of their origin.

The uredospores are commonly found entangled in the "brush" of the grain; so much so that Dr. Cobb found with a number of varieties that 57 per cent. of the grains were thus affected. Pickling the seed with any of the standard fungicides would kill these spores, but with untreated seed this is a possible starting point for the disease. It is not the only source of infection, as crops from pickled seed are affected by the rust fungus.

The system of harvesting with the combined harvester, so common in this country, means much wheat on the land, which germinates with the first rains, and possibly helps in the spread of the disease.

It has been shown (Klebahn) that the rust may be communicated to wheat from some grasses, so that the native grasses may play some part in carrying the fungus over.

Professor Osborn (*Journal of Agriculture,* August, 1916) lays a good deal of stress on the likelihood of the uredospores being blown about from place to place, and so starting all outbreaks of the disease by spores that had more or less recently matured at a place possibly hundreds of miles away. He makes out a strong case for this means of infection, and if it is correct it does away altogether with the need of the aecidiospore stage of the disease as occurs in Europe.

Visible Characters of Red Rust.

Red rust is characterised by the appearance on affected plants of small, more or less circular spots of iron-rust red powder on the leaves at heading time. If weather conditions are favorable to its development these spots very rapidly increase in size, but more in a line parallel to the veins than across the leaves, until they are long lines of red powder rather than spots. When the weather continues favorable these patches extend to the sheaths, and finally to the exposed stalk and the head. If the hand be passed along an affected stalk it will be marked by reddish lines similar in appearance to that left by fresh iron rust.

Effects of Red Rust.

When conditions favor this disease its effect on most varieties of wheat is terrible; it will in from three weeks to one month reduce promising crops to quite useless ones for grain, and even if these be cut for

hay before the rust has finished its course, the produce received is of very poor quality and low weight. It is no exaggeration to say "useless for grain," as the thousands of rust plants living on the sap of the wheat plant after it has finished extracting food from the soil, prevent the grain that had just formed when the attack started from developing, and if the crop is harvested, skins instead of grains are collected, and these are useless for anything. Even if the attack does not last until it kills the plants affected, the grain is always more or less injured, and grain from crops that have been rusted practically always weighs less per bushel than does that from rust-free crops in the same year. It reduces the weight of crops cut for hay to the extent that it used up materials from the plants, and the quality of the hay is spoilt because of the presence of so many fungus spores which do not improve the digestion of stock eating them.

Prevention of Wheat Rust.

As this disease does not make its appearance until the spring, and as a rule not until the wheat is out in head, it is almost impossible to imagine any practical means of combating it. No possibly useful practical methods of checking or eradicating the disease once it has appeared have been suggested, and the only one that has been seriously recommended—the spraying of affected crops—is surrounded by too many difficulties to be worth a second thought.

Rust Resistant and Rust Escaping Wheats.

All varieties of wheats are not liable to be affected by red rust to the same degree; some are not very subject to the disease; others are readily infected by the fungus and show plenty of evidences of the disease without being badly affected by it, others again are usually too far advanced towards maturity when the rust appears to be very badly injured; whilst others are very liable to it and are badly affected if the disease is present at all.

As has already been pointed out, the disease usually makes its appearance well on in the spring when the majority of wheats are breaking out into head, so that any wheat that is well advanced at this stage, although it may under ordinary circumstances be very liable to the attacks of the fungus, stands a good chance of reaching maturity without much injury being done to it. Wheats that miss the worst attacks of rust in this way are usually spoken of as rust escaping wheats, and they consist of "early" varieties that have a short period between flowering and ripening. Where attacks from rust are common, these wheats will usually be fairly free from much damage, providing they are sown early.

Because of some internal factor not yet understood, some varieties of wheat are not much damaged by the attacks of the disease; these wheats are known as rust resistant varieties. We know then that some varieties of wheats are rust escaping and others are rust resistant, and the only method of prevention that has proved of any practical value is to grow wheats that come under these two headings.

Rust outbreaks were very common in this State in the earlier days, but by substituting rust resistant for rust liable varieties we have considerably reduced the losses from this cause. These resistant varieties have been produced in Australia by cross-fertilisation and by selection, and we must see to it that we continue this good work—plant breeders aiming at varieties more resistant than any we have, and farmers selecting any plant they may find freer from rust than its neighbors.

6. WHEAT MILDEW (*Erysiphe graminis*).

This disease of wheat crops is becoming more or less common in our wheat fields, particularly in favorable years, and although it does not do much damage in Europe where it is common and practically always present, still under our conditions it may possibly develope into a serious pest and so is worth watching, and wherever possible discouraging.

The disease makes its appearance while the wheat plants are very small, and in early spring is much in evidence on the patches that are affected. Where the fungus is present, the bottom leaves and stems of the wheat plant are covered with an ashy grey to pinkish more or less felty mass of mildew, which rises like ashes when a person walks through an affected patch of crop. This mass consists of a collection of bundles of delicate threads which are seated on a slender branching mycelium. These threads are composed of numerous rounded or spherical cells attached to each other in a beadlike manner or in chains. The cells easily separate from each other and thus cause the ash-like dust that kicks up so easily. Later on this felty mass will be found to contain scattered over the white threads, brownish spherical conceptacles. Within these conceptacles are contained several sacs or spore cases called sporangia, each enclosing eight spores.

Effects of the Disease.

As the season advances and the summer arrives, practically all signs of the disease disappear and the crop recovers, but it cannot possibly yield as well as unaffected crops under the same conditions, particularly as it lives on the wheat crop just at the period when good healthy growth is so essential to good yields in this country.

Infection of Wheat Crops by "Mildew."

The fungus has stopped growing and dried up long before the wheat plants reach maturity, so the most likely source of infection is in the soil by falling spores and by affected straw being ploughed in. Also other grasses are liable to be attacked by this parasite, so very possibly these play a part in carrying over the disease until the particular field is again in crop. The ploughing in of manure made by animals eating affected hay or straw may also be a means of infection.

Prevention of Wheat Mildew.

This disease affects the leaves and the base of the stem of the wheat plants, so the burning of the stubble of affected patches will considerably help in checking the ravages of the fungus. The fungus attacks other plants of the grass family, so the fallow should be kept quite free from all weeds in those fields that show signs of the disease. If the disease is bad early in the season, the feeding off of the affected crop will help it considerably, as the admitting of sunlight and wind will kill the fungus. The patches most liable to attack are the lowlying spots of a field and these should be drained if the disease ever gets bad.

SUMMARY.

1. The fungus diseases are the result of small plants (the fungi) living on the sap of the host plants.

2. The spores of the wheat smuts germinate at the same time as the wheat by sending out threads, which enter the young wheat plant and grow up with it, and later produce a large collection of brownish-black powder in some part of the wheat plant, usually in the ear.

Bunt or Stinking Smut.

3. The spores of bunt take the place of the whole of the affected grains, except the outside skin.

4. The wheat crops are infected by the bunt spores lodging on the grain, and thus being sown with the seed.

5. The only practicable method of eradicating or checking bunt is by treating the seed with a solution of a fungicide.

6. A 1 per cent. solution of copper sulphate takes pride of place as a farmer's method of treatment.

7. For best results this solution should be poured on heaps of loose wheat on a floor and mixed with shovels until thoroughly wet.

8. A ¼ per cent. solution of standard formalin is a good pickle provided the grain is sown whilst still damp.

Loose Smut.

9. The spores of loose smut take the place of the whole of affected heads except the central stalks.

10. The grain is infected with this disease by the spores dropping on the ovary; growing into it, and remaining in a resting stage until the grain germinates.

11. This disease at present does so little damage to our crops that it is not worth the expense of specially treating the seed; but should it ever get bad enough to warrant it, immersion in water at 110deg. to 115deg. Fahr. for three hours will check it.

Flag Smut.

12. The spores of flag smut are produced on the leaves of the wheat plant, and the plants affected are usually so much weakened by the attack that they are unable to produce grain.

13. The wheat crops are infected by this disease through the soil, the spores finding their way there by dropping before the crop is harvested, and by straw or manure from affected crops being ploughed in.

14. As a means of prevention the stubble of affected crops should be burnt, land should be fallowed early, crops should not be sown early on infected soil, and only resistant varieties should be sown.

Takeall.

15. Takeall is characterised by the more or less circular shape of the affected patches and by the presence of dark powder or stain at the base of affected straws.

16. Infection with this disease appears to come wholly from the soil, particularly from the straw of affected plants.

17. As preventive measures the stubble from affected crops should be burnt, land should be bare fallowed early and worked well to keep it free from weeds. Oats should be used as a change crop with wheat on land that has shown signs of the disease. Good mechanical condition of the soil at seeding time should be aimed at so that the young wheat plants are strong enough to grow away from the parasite. Rolling the land heavily should be resorted to whenever it is doubtful if the undersurface is well compacted together.

Red Rust.

18. Red rust is characterised by affected wheat plants showing longish patches of iron-rust red powder on leaves, sheaths, and even stem and ear, from heading time until drying or ripening.

19. The mode of infection by rust is not yet thoroughly understood, but it appears likely that attacks are started by uredospores being blown from district to district or country to country by winds.

20. The only known method of preventing this disease is by using rust resistant and rust escaping varieties of wheat.

Wheat Mildew.

21. This disease attacks the base of the stems and bottom leaves of the growing wheat plant and is characterised by a more or less powdery mass of ashy grey to pinkish color on the plants.

22. The chances are that infection comes from the soil by affected matter being ploughed in and by the disease being continued on other grasses.

23. Known methods of prevention are by burning the straw of affected crops, keeping fallows free from weeds, feeding off affected patches, and draining low lying spots in the fields.

OIL PERCENTAGE IN DIFFERENT VARIETIES OF OLIVES.

[By H. E. Laffer, State Viticultural Instructor and Lecturer in Horticulture, Roseworthy Agricultural College.]

Just now, when there is a tendency towards considerable expansion of the area devoted to olive culture in this State, some information as to the relative percentages of oil in certain varieties may be of interest to those who may be planting trees.

It must be remembered that the profitable production of oil is not simply a matter of cultivating those varieties which give analytically the highest percentage. The regularity of cropping and the yields from respective varieties must be taken into account. Thus we may find that a variety giving only an average return in oil may prove more remunerative than one yielding a high proportion by reason of the former being a more regular and prolific fruiter.

Another point for consideration is the ease with which the oil is pressed from the pulp, some varieties in this respect being more easily worked than others. It would appear that some types contain a higher proportion of fats in a more or less solid condition, which can only be extracted by methods other than cold pressure.

Then, again, it will in all probability be found that the proportion of oil will vary in different seasons, localities, and soils. For this reason, results based upon the testing of fruit from one season only cannot be taken as conclusive, but at the same time they serve to indicate that there is a very wide divergence in the oil contents of different varieties grown under similar conditions.

In order to obtain some idea as to respective merits of certain named varieties growing at the College, samples were submitted to the State Agricultural Chemist (Mr. J. H. Phillips, B.Sc.), and the results of his investigations are submitted in the following table. In addition, the total fats per ton of fruit are given, taking the average specific gravity of olive oil as 0.916.

Variety.	Per cent. Moisture.	Per cent. Oil in Fresh Olives.	Gallons Per ton.
Marchiosa	42.36	27.29	66.73
Palermo	36.69	25.58	61.83
Boutillon	43.67	25.28	61.80
Leccure	40.11	24.95	61.00
Arecuzzo	41.46	23.51	57.50
Palsand	41.91	22.10	54.00
Piegale	39.06	21.75	53.19
Unknown	48.78	19.37	47.36
Sir Geo. Grey	43.61	18.19	44.48
Bouquettier	54.68	17.64	43.13
Tarascon	45.86	16.93	41.00
Del Morocco	54.58	11.54	28.22
Smiths Variety	49.97	11.51	28.14

The samples of fruit were, with two exceptions—Marchiosa and Leccure—of an even state of ripeness and falling from the trees, and all were weighed immediately after picking. The two mentioned were considerably less ripe, but owing to the rate at which the starlings were removing them, it was advisable to secure the lot at once.

The trees from which the samples were obtained were grafted as seedlings in 1906 and planted from the nursery in 1907. With one or two exceptions the 1916 crop was the first, giving a period of about nine years to come into bearing. The most prominent exception was Arecuzzo, which fruited in its sixth year, and promises to be a good cropper. It is of a low, bushy habit, carrying its fruit in clusters, and, with a good average yield of oil, looks like a variety worth cultivating. Marchiosa and Leccure both carried heavy crops in 1916, the fruit being of good size and easily gathered.

It is recognised that, for practical results, samples should be tested both analytically and by pressure for several seasons before a reliable standard can be obtained, but as a beginning in this direction and for the purpose of recording these tests, the results so far obtained are published.

AGRICULTURAL EXPERIMENTS.—REPORT FOR YEAR 1916-1917.

[By W. J. Spafford, Superintendent of Experimental Work].

EXPERIMENTS AT HAMMOND.

(Conducted by Mr. T. Griffin).

Since 1908 Mr. Griffin, in conjunction with the Department of Agriculture, has been conducting cultivation experiments with wheat-growing. These experiments were built up on the so-called Campbell's system of dry farming, varied to suit local conditions, and the block of land used each year was divided into equal-sized plots (five acres), each of which received different cultivation treatment. At seeding each plot was sown to the same variety and quantity of wheat, and dressed with the same quantity of superphosphate.

The results obtained over the period 1908-1915 showed—(1) That when subpacking is done just before seeding it gives, at Hammond, no increase over land not subpacked. (2) That subpacking the soil at Hammond immediately after ploughing is worth a bushel extra yield over and above that obtained from land not subpacked.

The figures showing the above results are to be found in the *Journal of Agriculture* of November, 1916.

As a bushel per acre increase for subpacking the land immediately after ploughing is not nearly sufficient to encourage farmers to speculate in an implement for which there is no other work, it was decided to change the system of plots and to find out the exact value of the subpacker as compared to the land roller, which is an implement used for purposes other than the preparation of the fallow.

Cultivation Plots at Hammond, 1916.

The new cultivation plots at Hammond were prepared in 1915 and cropped in 1916, and consist of plots—

(1) Comparing the effects of rolling and subpacking on 6in. ploughing.

(2) Comparing the effects of rolling and subpacking on 3in. ploughing.

(3) Testing land cultivated at ploughing time and worked in the same way as ordinary ploughed fallow.

Another plot, testing the effect of cultivating the land in the early autumn and then ploughing it in May, has been included in the fallow for the 1917 crops.

Yields from Cultivation Plots.—Hammond, 1916.

Plot.	Soil Treatment.	Grain per Acre.
		Bush. lbs.
1	Ploughed 6in. deep and rolled the same day as ploughed; harrowed within a day or so; cultivated or harrowed whenever crust or weeds render necessary	19 49
2	Ploughed 6in. deep and subpacked the same day as ploughed; cultivated or harrowed whenever crust or weeds render necessary	20 43
3	Ploughed 3in. deep and rolled the same day as ploughed; harrowed within a day or so; cultivated or harrowed whenever crust or weeds render necessary	18 39
4	Ploughed 3in. deep and subpacked the same day as ploughed; cultivated or harrowed whenever crust or weeds render necessary	18 4
5	Cultivated (not ploughed) at ploughing time; cultivated or harrowed whenever crust or weeds render necessary	17 14
	Rainfall for year 13·42in.	

All plots were drilled in with 1bush. of Bearded Gluyas wheat and 80lbs. superphosphate to the acre.

Wheat Variety Tests.

As well as the cultivation tests, Mr. Griffin has, since 1908, compared each year a number of varieties of wheats sown on ordinary fallowed land with a dressing of 80lbs. superphosphate to the acre. The following table shows how some of these varieties have behaved during the above-mentioned period:—

Table—*Showing Yields of Some of the Varieties of Wheats tried at Hammond since* 1908, *with 80lbs. Superphosphate Per Acre.*

Variety.	Average for 1908-11.	1912.	1913.	1914.	1915.	1916.
	Bush. lbs.	Bush. lbs.	Bush. lbs.	Bush. lbs.	Bush. lbs.	Bush. lbs.
Federation	14 11	1 13	Failure	Failure	5 23	19 56
Yandilla King ..	12 9	—	Do.	Do.	8 25	23 20
Gluyas.........	13 15	—	Do.	Do.	8 40	16 9
Viking	13 32	—	—	—	—	—
Red Russian ...	—	—	—	—	9 37	17 58
King's Early ...	—	—	—	—	4 27	14 13
Queen Fan	—	—	—	—	—	18 45
Bearded Gluyas..	—	—	—	—	—	16 58
Rainfall........	11·29in.	10·77in.	6·54in.	8·57in.	8·87in.	13·42in.

HUNDRED OF BUTLER.

The hundred of Butler, on Eyre's Peninsula, is a comparatively new district, but it has been occupied sufficiently long for the settlers to realise that some experimental work is necessary if the most is to be

made of the natural conditions. With this object the Department of Agriculture was approached, and experiments with varieties of wheats and quantities of superphosphate have been conducted during the past season, and will be continued in the future.

Much of the part of the district being farmed consists of easy-working limestone soil that has carried good mallee; and as the rainfall is a little above 16½in. per annum on the average, the solution of the most suitable varieties and the most profitable dressing of superphosphate to supply with the seed should not be very difficult to obtain, as a good deal of our older wheatgrowing country is very similar in climatic and soil conditions to that being tested.

Testing Varieties of Wheats in the Hundred of Butler.

[Experiments conducted by Mr. S. L. Butler.]

The varieties being tested were sown on fallowed land of a light limestone nature, parts of which are fairly stony. Eighteen acres were set aside for these plots, so that three-acre plots of six varieties could be sown side by side. In June the seeding was carried out, using 1bush. of seed and 1cwt. of superphosphate to the acre for all kinds. The germination and early growth of all varieties was good, but in the spring trouble arose in the form of "take-all," and Mr. Alcock, on his visit of inspection, estimated the various varieties to be affected by the above-mentioned dread disease to the following extent:— Yandilla King, 10 per cent.; Gluyas, 25 per cent.; King's Red, 33 per cent.; Queen Fan, 50 per cent.; Firbank, 60 per cent.; Marquis, 50 per cent.

Despite the ravages of the "take-all (*Ophiobolus graminis*), some of the varieties gave fair yields, as the following results show:—

Varieties of Wheats—Hundred of Butler, 1916-1917.

	Grain per Acre. Bush.	lbs.
Yandilla King	15	23
Gluyas	12	1
King's Red	10	19
Queen Fan	8	14
Firbank	5	34
Marquis	4	24

Rainfall for year, 15.60in.

Manurial Experiments in the Hundred of Butler.

[Conducted by Mr. C. F. Jericho.]

On Mr. Jericho's farm Gluyas wheat was sown on fallowed land, with various dressings of superphosphate using 1bush. of seed to the acre in all cases. The block of land chosen

for these plots was a very nice-looking piece of fallow, well worked and fairly free from weeds; but heavy rain did not fall early enough in the season to compact it well together, nor to germinate the weeds. "Take-all" made its appearance in the spring in some of the plots, and later was more or less in evidence in all of them. Even with the presence of this trouble, the plots made good growth, and attracted a good deal of attention from the neighboring farmers. The returns are very satisfactory, considering the conditions, and are to be seen in the table following:—

Yields from Manurial Plots —Hundred of Butler, 1916-1917.

		Grain per Acre.	
		Bush.	lbs.
Gluyas Wheat:	No manure	12	12
Gluyas Wheat:	½cwt. superphosphate	16	17
Gluyas Wheat:	1cwt. superphosphate	16	32
Gluyas Wheat:	2cwts. superphosphate	23	32
Gluyas Wheat:	3cwts. superphosphate	28	31

Rainfall for year, 15.60in.

These results are not an absolute criterion of the effects of the different dressings of superphosphate for the season under review. The no-manure and the ½cwt. plots showed much "take-all" fairly early in the season, so they were each cut in half, and only the unaffected half of each was harvested for grain. The remaining plots appeared to be but very slightly affected by the disease until the machine was put in them to take off the grain, when more or less affected patches were found to be plentiful.

These plots offered a good object lesson in the checking of the wheat-crop disease "take-all." Before ploughing the field in which the plots were placed, it was found to be necessary to burn the bushes that had grown after the last crop of wheat, and in doing this some patches in the field were not sufficiently covered with bushes for the fire to run. Such an unburnt patch came across one end of the manurial plots, and it was only on this patch where "take-all" was very bad, thus showing the efficacy of fire in the control of this disease. Also, it was to be clearly seen that as the dressing of superphosphate got higher, so the amount of "take-all" became less, showing that the feeding of the crop gives it a chance to grow away from the disease.

EXPERIMENTS AT WILKAWATT.

[Conducted by Mr. W. J. Tylor.]

On comparatively poor soil at Wilkawatt, consisting of whitish sand at the high end of the block to sandy loam at the lower end, experiments

with various manures have been conducted for the past three years. The plots in 1914 and 1915 were of a preliminary nature, and were used to point the way to the best type of experiments for the special conditions of this particular district. On the results of these two seasons the various plots have been arranged as follows:—

Manurial Experiments with Wheat at Wilkawatt.

In these experiments the wheat is sown on bare fallow, in the three-course rotation—bare fallow, wheat, pasture—and the treatment of the various plots is as follows:—

Plot.	Manuring per Acre.
1.	½cwt. superphosphate.
2.	1cwt. superphosphate.
3.	2cwts. superphosphate.
4.	1cwt. basic slag.
5.	No manure.
6.	2cwts. basic slag.
7.	2cwts. superphosphate; ½cwt. nitrate of soda (spring).
8.	2cwts. superphosphate; ½cwt. sulphate of potash (seeding).
9.	2cwts. superphosphate; ½cwt. nitrate of soda (spring); ½cwt. sulphate of potash (seeding); 5cwts. lime.
10.	5cwts. lime.
11.	5cwts. lime; 2cwts. superphosphate.

Besides these purely manurial plots, a series of rotation plots, having as their object the improvement of these soils by a good deal of stocking and but little cropping, was commenced in 1916, with the hope of continuing the same for a fairly long period of years. Here a block of land of 25 acres was divided into five plots of 5 acres each, to be treated in the following manner:—Bare fallow; wheat (with lucerne) and 2cwts. superphosphate per acre; lucerne for grazing; lucerne for grazing; lucerne for grazing.

Yields of Manurial Plots—Wilkawatt, 1916-1917.

Plot.	Manuring per acre.	Grain per Acre. Bush.	lbs.
1.	½cwt. superphosphate	12	49
2.	1cwt. superphosphate	13	42
3.	2cwts. superphosphate	19	39
4.	1cwt. basic slag	12	32
5.	No manure	12	6
6.	2cwts. basic slag	18	56
7.	2cwts. superphosphate; ½cwt. nitrate of soda (spring)	22	17
8.	2cwts. superphosphate; ½cwt. sulphate of potash (seeding)	21	7
9.	2cwts. superphosphate; ½cwt. nitrate of soda; ½cwt. sulphate of potash; 5cwts. lime	21	18
10.	5cwts. lime	14	49
11.	5cwts. lime; 2cwts. superphosphate	18	37

One bushel of Baroota Wonder wheat was drilled in to the acre on all of the plots.

For each of the three years from 1914 to 1916 the following plots were harvested, the results from which certainly show the advantage of using a dressing of up to 1cwt. of superphosphate per acre:—

Plot.	Manure per Acre.	Grain per Acre.							
		1914.		1915.		1916.		Means 1914-1916.	
		Bush.	lbs.	Bush.	lbs.	Bush.	lbs.	Bush.	lbs.
5......	No manure	1	11	8	43	12	6	7	20
1......	½cwt. superphosphate	3	34	9	16	12	49	8	33
2......	1cwt. superphosphate	3	56	15	17	13	42	10	58

This shows an increase of a little over 3½bush. where 1cwt. superphosphate was used as a dressing, which, at 3s. 6d. per bushel, is considerably above the cost of the manure.

For the last two seasons the following plots were harvested, the results from which are appended:—

Plot.	Manure per Acre.	Grain per Acre.					
		1915.		1916.		Means 1915-1916.	
		Bush.	lbs.	Bush.	lbs.	Bush.	lbs.
1......	½cwt. superphosphate	9	16	12	49	11	2
2......	1cwt. superphosphate	15	17	13	42	14	29
3......	2cwts. superphosphate	21	8	19	39	20	23
4......	1cwt. basic slag	11	38	12	32	12	5
5......	No manure	8	43	12	6	10	24
6......	2cwts. basic slag	13	37	18	56	16	16

These results again show the advantage of fairly heavy dressings of superphosphate with wheat; the 2cwt. dressing shows 10bush. increase on no manure; 9 1-3bush. on ½cwt.; and 6bush. on 1cwt. dressing.

Rotation Plots—Wilkawatt.

The rotation plots are each about 5 acres in area, and consist of rather poor soil, both ends of each plot being white sandhills, whilst the centre is a rather light sandy loam, with a few silt hollows that hold water rather tenaciously. So far the wheat crops have not come on land that has had lucerne grazed off, so they are only ordinary fallow results.

Yields of Wheat in Rotation Plots—Wilkawatt, 1915-1916.

	Grain per Acre.					
	1915.		1916.		Means 1915-1916.	
	Bush.	lbs.	Bush.	lbs.	Bush.	lbs.
Wheat with 2cwts. superphosphate	10	46	12	8	11	27

KANGAROO ISLAND.

[Conducted by Col. J. W. Castine.]

After a lapse of one year, the experimental plots at Col. Castine's farm, "The Springs," on Kangaroo Island, were continued. The previous attempts at cereal growing on this ironstone country, despite the very favorable rainfall, were anything but successful, so the experiments were confined to manurial tests with the two cereals most likely to prove of some use under these particular conditions, viz., rye and oats. The soil conditions at "The Springs" are quite different from anything on the mainland, and although the season under review was very favorable to the cereals throughout the bulk of the State, it did not prove so with these plots, as the following tables of results show:—

Yields of Oats at Kangaroo Island, 1916-1917.

Plot.	Manure per Acre.	Grain per Acre. Bush.	lbs.
1.	2cwts. basic slag	1	3
2.	2cwts. superphosphate	1	23
3.	2cwts. basic slag; ½cwt. nitrate of lime	1	11
4.	No manure	Failure	
5.	2cwts. basic slag; ½cwt. sulphate of potash	1	29
6.	2cwts. basic slag	2	15
7.	3cwts. basic slag; 1cwt. sulphate of potash; 1cwt. nitrate of lime	1	4
8.	3cwts. basic slag	1	21
9.	1cwt. "Ephos" basic phosphate	1	1
10.	2cwts. "Ephos" basic phosphate	1	15
11.	No manure	1	3
12.	3cwts. bonedust	0	38
13.	2cwts. basic slag; 4cwts. hashmagandy	1	17
14.	2cwts. basic slag; 1cwt. hashmagandy	1	13
15.	No manure	0	34

Algerian oats were sown on all plots at the rate of 1½bush. per acre.

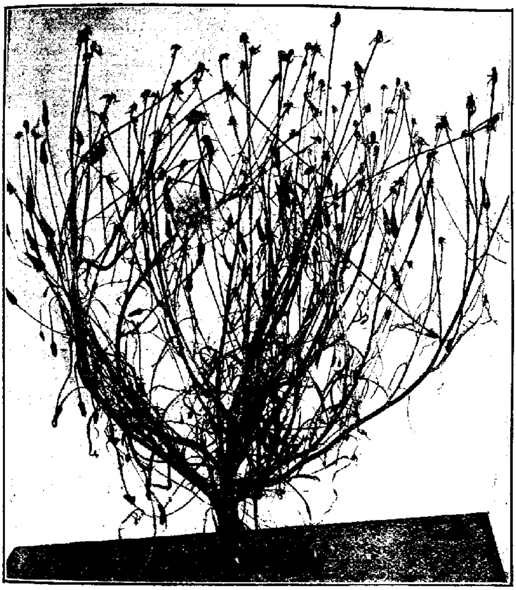
Yields of Rye at Kangaroo Island, 1916-1917.

Plot.	Manure per Acre.	Grain per Acre. Bush.	lbs.
16.	No manure	3	30
17.	2cwts. basic slag	4	33
18.	2cwts. basic slag; ½cwt. nitrate of soda	4	11
19.	2cwts. bonedust	2	0
20.	2cwts. basic slag; 2cwts. hashmagandy	1	47
21.	2cwts. superphosphate	1	48

A NEW WEED.

[By H. W. ANDREW, Botanical Assistant and Quarantine Officer for Plants, S.A.]

During the year 1916 at least seven introduced weeds were discovered for the first time in this State. Among those found by the writer another remains yet to be placed on record in this *Journal*. This weed was found on neglected cultivated land at Collinswood, in



the District Council of Prospect, and, judging by its present distribution, has been established for a few years, although apparently confined to that locality.

SCORZONERA LACINIATA, L.

This plant, also known as *Podospermum laciniatum*, DC., is represented by a few score specimens only. It is a biennial (or perennial?) up to 20in. high, with a taproot like that of the salsafy (*Tragopogon porrifolius*), to which it is nearly related. Specimens

here have ascending branches with lateral spreading stems, leaves much divided (*pinnatisect*) with linear or linear lanceolate segments. The achenes, or "seeds," sub-cylindrical, striate, and supported by a hollow pedicel a little shorter than the achene with feathery pappus of a dirty white. Flowers pale yellow, scarcely exceeding the involucre. A close examination of the accompanying figure will reveal the rather distinctive globular head of seeds, somewhat resembling the heads of the true dandelion, or those of salsafy, both of which have established themselves on the plains of Adelaide and other parts of the State. Since a great number of flower heads are found on one plant, and as each head contains up to 60 or more "seeds," and further, as each seed is provided with a feathery pappus to aid in its dispersal, it is likely that this plant will become more widely distributed unless steps be taken to check or exterminate it. At the time of writing the ground immediately around growing plants is white with the numerous seeds shed by them. The whole plant presents a very weedy appearance; and its value as a fodder plant, if any, would be largely discounted by its spreading, weedy habit, which would probably smother more useful fodder plants. Although an exceedingly large family of plants, the *Compositae*, or daisy family furnishes comparatively few fodder plants. At least two species of *Scorzonera*, however, are cultivated in Europe, and used as an esculent vegetable, viz., *Scorzonera hispanica* and *S. deliciosa*. The species described above is reported to be the commonest of this group of the family occurring in the Mediterranean region.

THE MANURING OF VINEYARDS.

[An Address delivered before the Berri Branch by H. E. Laffer, Viticultural Instructor.]

The question of manuring vineyards is one which is receiving greater consideration from year to year, and which will, in the near future, become of more importance to the viticulturist. In the irrigation settlements along the Murray, where the land is relatively poor, and heavy crops are removed annually, it is a matter of paramount importance. This land, which is so admirably suited to irrigation, produces luxuriant growth and very heavy returns of fruit, largely owing to the latent fertility which is made available by the application of abundance of water during the growing period of the vines. In addition, there is the fact that in these loose open soils the vines root so freely that they draw nourishment from a relatively large bulk of soil, and thus for a number of years appear to secure sufficient food for all

their needs. The time will come, however, when they will fail to maintain this vigor, owing to the greater difficulty of securing supplies readily, a fact which is evidenced by the necessity to reduce the number of arms upon the vines. It is recognised that vines, in common with all our cultivated plants, draw from the soil certain elements of plant food which bear a definite relation one to another in the different plants under consideration. It follows, naturally, that if the fertility of the soil is to be maintained, and returns in the form of fruit kept up to normal, these plant food elements must be brought within easy reach of the plants by artificial means.

So far, in Australia, little has been done in the way of consistent manurial experiments upon vines, although in the older countries the application of fertilisers to the vineyards is a part of the annual cultural operations.

With the high cost of labor under Australian conditions, coupled with low average returns from our vines, the production of heavier yields from smaller areas should be the aim of the vigneron.

Although we have certain rules to guide us in the practice of manuring, no hard-and-fast rule can be laid down for general conditions. The success attending the practice depends upon local factors, such as climate, soil, and the available moisture supply. Probably the last-named is the most important, for unless there is ample moisture to make the manure available, and to transmit it throughout the system of the vine, there will be little or no result. In this respect, it may be said that the Murray Irrigation Settlements are ideal for effective manuring of the vines. The soil is relatively poor, from an agricultural point of view, and lends itself readily to the application of fertilisers, while the summer irrigation supplies the moisture which makes available the active principle of the manures at the time when it is most needed.

It has been said already that the vine requires certain definite proportions of the plant foods, and although these may be fairly abundant in a soil, and create luxuriant growth for the first few years, there comes a time when the vine has to do a great deal more searching with its roots before these wants are supplied. It does not necessarily follow that the supply is exhausted, but rather that the more available portion of the plant food has been used up. The balance will be in more or less insoluble compounds, the splitting up of which may be a comparatively slow process, so that the needs of the plant may be fulfilled only with difficulty. It is then that one finds that the vine may have too many arms, or is given too much fruit wood, the growth and returns suffering in consequence; and if this growth is to be maintained, then we must provide for the vine the required nourishment in a readily accessible form.

The main elements required by the vine as plant food are the same as in the case of most other plants, namely, nitrogen, phosphoric acid, potash, and lime; and these are required in such quantity as to render the exhaustion of the available supply a reasonable possibility. Of other substances, such as iron, magnesia, &c., the quantities used annually are so small as to have little effect on the available supply.

Thus we find, in any system of manuring, that it resolves itself into a question of profitably applying manures of a nitrogenous, phosphatic, or potassic nature. The question of lime will be referred to later, as representing more value as an improvement to the texture of the soil than as a direct fertiliser.

Nitrogenous Manures.

Of this class we have two main types—those of organic origin and those of inorganic or mineral origin. The former is derived from decayed organic matter of any description until it becomes incorporated with the soil. It supplies during the process of decay that all-important soil constituent, humus, which is so necessary, not only as a source of fertility, but as a means of increasing the moisture-retaining capacity of a soil. This may be considered as one of the most essential points in the manuring of Australian vineyards—that is, the increase of humus in the soil, and any system which will serve to this end cannot be other than advantageous.

Unfortunately, except for limited areas, the use of farmyard manure is out of the question, owing largely to the fact that supplies are not available. Where this commodity is obtainable, even if its use is confined to small areas, its value as a fertiliser and improvement to soil texture cannot be over estimated. It supplies not only humus, but on the decomposition of its substance, quantities of all the necessary fertilising elements are liberated. Incidentally, by its presence in the soil, the texture and moisture retaining capacity of such soil is improved.

It may be said, then, that with few exceptions, farmyard manure is out of the question for areas of any considerable extent; but there remains the practice of "green manuring," which is a practicable undertaking even in large vineyards. Described briefly, the system as practised consists in growing some crops between the rows of vines or fruit trees, sowing in the autumn, and ploughing under in the late winter, when the plants composing the crop are in a succulent state.

For the most part, plants of the legume family are adopted, as being in themselves nitrogen gatherers, and the most commonly used is field peas.

As a fertiliser to the crop for its immediate needs, superphosphate is applied at time of sowing, and as the legumes require large quantities of potash, this manure may be applied in small quantities in conjunction with the super. At the present time potassic manures are unobtainable; but, after all, super. by itself is in most cases sufficient for the needs of the crop.

Ploughed in just about the time the peas are flowering, or before if conditions of climate make it imperative, the substance of the crop decays down rapidly, to become incorporated with the soil. In the light lands of the irrigation settlements, nitrification is a rapid process, and this organic matter quickly becomes available to the plants, promoting health and vigor in the vines.

On the light irrigable lands this practice should commend itself for trial in any scheme of manurial experiments. A green leguminous crop, grown with super. and ploughed in, should represent practically the equivalent of good farmyard manure, with the added advantage that its decay is rapid.

Mineral nitrogen as a fertiliser is represented by ammonium sulphate and sodium nitrate, both of which are available, and are very active agents in creating vigor in the vine. It has to be remembered that their cost is relatively high, and so they should not be used in quantities excessive to the demands of the vines on any one soil. No hard-and-fast rule can be laid down, but the question as to quantity should be determined by careful experiment. In fact, the whole practice of vineyard manuring is largely a matter for experiment at the present time, and it is only by carefully tabulating results for a number of years that any reliable estimate can be arrived at. As a basis for working upon, quantities of from 1cwt. to 2cwts. per acre applied during the early growing period might be tried.

In connection with irrigated vineyards, there is one point to be considered in the use of nitrogenous fertilisers, viz., guarding against the production of too luxuriant foliage. This might tend, especially if the potash and phosphoric acid were deficient, to lead to a more pronounced unevenness of ripening in the case of currants. However, that is a matter which can be easily overcome. Given that other conditions are suitable to growth, it is often astonishing how well vines do in soils which are comparatively deficient in nitrogen.

Potassic Manures.

While the nitrogenous substances absorbed by the vine or tree go to the building up of the foliage and woody structure, potassic elements are concentrated almost entirely in the fruit. This is amply demonstrated in the grape by the fact that the fruit is highly charged with potassic salts, the chief of which being cream of tartar, or acid potassium tartrate. The whole of the world's supply of this commodity is derived from the wine industry.

Potash, then, is a very necessary element in the nourishment of the vine, and soils rich in potash are noted for heavy production of fruit. Most of our soils in South Australia are plentifully supplied with potash in some form or other, although it may not be readily available to plants.

The use of potassic manures is one which should receive attention in the Murray settlements, where vines are grown under forced circumstances, and are encouraged to carry very heavy crops of fruit on relatively poor land. There can be no denying that these same vines have remained vigorous over a considerable number of years, but the time must come when more attention must be given to the maintenance of the natural fertility of the soils.

Unfortunately, at the present time potassic manures are unobtainable; but no doubt research will demonstrate that the world's supply is not confined to Germany.

Potash, in the form of either the sulphate or chloride, is expensive, and, as already stated, most soils have a good reserve supply. It is only necessary to supplement this with light quantities of readily soluble potassic salts. We apply potash in the form of sulphate or chloride, these being the most convenient forms available; but in these forms it cannot be assimilated by plants. It must first undergo a reversion to potassium carbonate, and it is in this connection that the use of gypsum is at times highly advantageous to soils rich in potash.

As already stated, the potash supply in a soil may be extensive, but unavailable to the plants, because it is out of reach of the root system.

Nature holds potash in the form of carbonate in the surface soil, so that deep-rooted plants are unable to touch it. If to such a soil we apply a dressing of gypsum (calcium sulphate), a chemical reaction takes place, and on the one hand we have formed potassium sulphate, on the other calcium carbonate, or lime.

As sulphate, the potash is dissolved and carried down to the deeper soil layers, but it is in a form of no use to the plants. A further reaction takes place, the sulphate becomes sulphide, and finally the sulphide becomes carbonate. Thus we have the potassium carbonate deep down where the roots of the vine can reach it. This reaction is of special importance in the heavier classes of land, which, at the same time, are usually richest in potash.

In the artificial form potassic manures are costly, and must be used with discretion. If they lead to heavier crops of fruit, it must be remembered that the tax upon the other portions of the vine will be proportionately greater and the vigor of vegetation must be kept up to normal pitch by supplying the needs of the vegetative organs, in order to preserve the balance between fruit and vegetation.

Quantities varying from ½cwt. to 1cwt. per acre should be sufficient to serve the needs of most soils when supplementing the natural supply. It may be applied in the winter ploughing, or where irrigation is practised, it may be applied and washed down by the first watering.

Phosphoric Acid.

This important element of plant food appears to be more general in its influence upon the vine. It conduces towards the general health of the vine, and is said to play an important part in the ripening of the wood. It is well known that our soils are lacking in phosphates, and I am inclined to the opinion that upon the Murray Settlements more benefit will be derived from the use of phosphates than from any one manure.

Fortunately, the supply of phosphatic manures is unlimited, and is obtainable with a high degree of solubility at a cheap rate.

The only difficulty would appear to be in the method of application, and this is a matter which depends primarily on the nature of the soil.

It has been demonstrated that soils of a heavy nature have the power of retaining the phosphoric acid in the surface, and therefore in soils of this description it is wise to place the phosphate as deep down as possible.

In the lighter soils of an open, sandy or gravelly nature, especially where irrigated, there is no great difficulty. On this class of soils phosphatic manures should give quick and satisfactory returns, and should receive consideration from every irrigationist who desires to maintain the vigor and production of his vines at high level.

Sickly vines produce sickly fruit, and if the quality of our dried fruits is to be kept at its present high standard, we must see that the vines are healthy and of normal vigor.

In conclusion, I should like to say that this matter of manuring vines is worthy of early attention, not waiting to see the vines show appreciable signs of debility. Such debility may mean a diminished crop for the time being, and a loss in value which would fertilise the vineyard for a number of years. In addition, it is far easier to maintain the normal vigor of the vines than it is to renew this vigor once they are appreciably weakened.

It is estimated that vines remove from the soil each year approximately 45lbs. nitrogen, 40bs. potash, and 10bs. phosphoric acid per acre, a loss which in the strong rich soil may not be felt for a great number of years. On light soils, such as are being irrigated along the Murray, where the growth and production are forced by the heat and water, the time is not far distant when a regular system of manuring will become an annual practice.

Lime and Gypsum.

Lime and gypsum have already been mentioned in connection with manures.

There are very few vineyard soils in South Australia but have sufficient lime in their composition to supply all needs of the vine in the form of food. It is as "improvers" to soil that they play their most important part.

Clay soils devoid of lime are impermeable to water, and almost unworkable, owing to their sticky nature. Lime possesses the power of flocculating the clay particles, making it more crumbly and open in nature. Water can soak down, and the roots of plants find easier passage in their search for food. Insoluble compounds are attacked, being split up to form simpler water-soluble substances.

Considering ordinary lime first, we have the two forms, or perhaps three. The first is the plain, unburned ground limestone or calcium carbonate; secondly, there is quick lime; and, thirdly, slaked lime.

Of the three, quick lime is the most active in its effects upon clay soils so far as flocculating is concerned. On the Murray, the bulk of the irrigated land is not needing this treatment, the exceptions being some of the heavy flat land closer to the river. On these portions lime in one or other of its forms would no doubt be beneficial.

Gypsum has already been referred to in its action upon the potash salts in clay soils, and it is in this respect that it is most useful. In its action on soils generally it is not such an active agent as lime. At the same time, it has a considerable effect on the texture of the soil, and is a valuable remedy for soils too stiff in their nature.

Of the other substances mentioned as necessary to the welfare of the plants, most soils contain a sufficiency to supply all needs, and it therefore becomes superfluous to apply as dressings to a vineyard.

SOME POINTS IN WHEAT-GROWING

[An address delivered by Mr. W. J. SPAFFORD (Superintendent of Experiments), before the members of the Milang Branch of the Agricultural Bureau.]

The wheat crop will be the most important crop that can be grown for many centuries to come, for it is one of the main foods of the civilised portions of the human race, and is becoming increasingly so, as the people of the East are just beginning to make it one of their ordinary foods. Even without the increased requirements due to new people using wheat, the populations of wheat-eating nations are increasing very much more rapidly than is the supply of the grain, and so the demand for it must increase.

Wheat can be grown more or less successfully in all parts of this State where the rainfall is sufficient to supply the crop's water requirements, but to make the most of the crop there are some points in the operations connected with its growth which are absolutely essential, and it is to these essentials that I wish to refer.

REQUIREMENTS OF THE WHEAT PLANT.

The wheat plant, like all other forms of life, needs food, moisture, warmth, oxygen, and a medium in which to live. Now, the plant starts its growth from the seed—or grain, as we usually know it—by sending out a shoot and roots, when this seed remains in contact with moisture and when the temperature is sufficiently high. This shoot and the roots live and grow by using up the food stored in the seed, and when this is all gone the plant has to supply its own food. What these necessary foods are will be shown if we analyse a full-grown wheat plant, and it will help us to realise how, and from where, the various substances contained in such a plant are obtained.

In the first place, if we weigh the plant, and then heat it to the boiling point of water, and keep it at that temperature for some time, and then re-weigh it, the difference in weight will show the amount of moisture that the plant contained.

If the plant be now burnt, only a very small quantity of ashes will remain, and that which was destroyed in the burning represents the carbon, whilst the ashes consist of the mineral matters. This ash is then chemically analysed, and the various mineral substances of which it is composed are separated and weighed.

An analysis like this shows the average wheat crop to consist of:—

Table showing the Composition of Wheat—Grain and Straw (from "Artificial Manures," by Ville).

	Per cent.	
Carbon	47.69	These 93.55 parts are derived from the air and rain.
Hydrogen	5.54	
Oxygen	40.32	
Soda	0.09	Total 3.386. The soil is superabundantly provided with these constituents, which it is quite unnecessary to add to it.
Magnesia	0.20	
Sulphuric acid	0.31	
Chlorine	0.03	
Ferric oxide	0.06	
Silica	2.75	
Manganese	(?)	
Nitrogen	1.60	Total 3.00. These the soil possesses only to a limited extent, and the deficiency is supplied by artificial manure.
Phosphoric acid	0.45	
Potash	0.66	
Lime	0.29	

Now of these substances the carbon is obtained from the carbonic acid gas of the air, by its entry into the leaves through the breathing pores, and is then split up by the chlorophyll, or green coloring matter.

All of the mineral substances are taken up by the roots of the plants, and as these roots are all in the soil the only place that they can obtain these minerals is from the soil. Besides these mineral matters the plant also takes its moisture from the soil. The necessary oxygen is taken mainly from the air by the breathing pores of the leaves, but also by the roots from the air imprisoned in the soil.

The soil, besides supplying the mineral plant food, the moisture, and some of the oxygen, must also be the medium in which the plant is anchored for life, and must be in such a state that the roots can move freely in search of their requirements.

Preparation of the Land.

As the warmth is supplied by the sun, and as the carbonic acid gas and the oxygen are always plentiful in the air, we have no concern, or at all events no control of these substances, and so we can direct our attention to the soil, the supplier of the other essentials to the plant's growth. The soil to carry a crop of wheat must contain the foods necessary to its good growth in such a form that they are readily available to the plants: it must contain sufficient moisture for the requirements of plants, and it must be in such a state of tilth or mechanical condition that the roots can travel freely through it in their search for food, moisture, and air.

Also wheat is a plant that has been cultivated and pampered for thousands of years, and as such is wholly dependent on the help of man to make good growth, and it is by the way man cultivates the soil that he helps the plant more than by anything else he may do.

The Seed Bed.

If the plant foods and the moisture necessary to the wheat plants are present in the soil, the period in its growth at which the condition of the soil has the greatest influence on the plant is when the plant is young—from the germination until it is some few inches high; and as we cannot do much to the soil after the seed has been put in, it must be prepared before seeding operations commence, and we usually speak of this prepared soil as the "seed bed." It is this seed bed that plays such an important part—particularly in a climate similar to ours—in what will be the ultimate success of the crop.

The experience of thousands of years has shown the ideal seed bed to produce the maximum crops of wheat to consist of soil that has been ploughed up, and then so worked that it is free from weeds and has only the immediate surface loose—say 1½in. to 2½in.—and the under-layers well compacted together. This seed bed should be always kept in mind, and every tillage operation conducted should do something towards helping to ultimately produce such a condition of the soil.

In Local Practices.

Where we include bare fallow before wheat in our practice, this seed bed is easily attained. Here we plough the land as soon after seeding operations as possible, and before the heavy rains are finished; these rains compact the soil together again, and we cultivate the surface to keep it free from weeds, and to prevent the formation of a crust on the surface of the soil, with its consequent loss of moisture. To have the soil in the right state of tilth at seeding time, the ploughing should be done as deep as local conditions allow, but the subsequent operations should be only just as deep as is necessary to do the work required. If for any reason a cultivation of any kind has to be done deeply—say more than 3in.—and fairly plenteous rain does not fall soon after, the damage done by loosening the compacted under-layers should be corrected by a more or less heavy rolling shortly after cultivation.

Where wheat is sown on land not bare fallowed, this seed bed must be produced in a short space of time, and the simplest way to get anywhere near the mark is to plough the land as shallow as is possible to make a good job of it, roll to press the soil and the organic matter ploughed under together, and cultivate in some way before the seed goes into the soil. This very shallow ploughing is not good for the soil, and so not good for the State, so wherever possible the soil should be ploughed well and very heavily rolled to thoroughly compact the soil together, and then the surface should be worked so that it will properly cover the seed.

MANURES.

The average analysis of the wheat plant quoted above shows what mineral matters must be present in an available form in the soil to enable the wheat plants to make good growth. Soil analyses and general experiences have shown that of the essential plant foods to be got from the soil the only ones at all likely to be deficient are potash, nitrogen, phosphoric acid, and lime, and so these are the only ones that need be applied to the soil for maximum results.

POTASH.

The bulk of South Australian soils show on analysis to be particularly rich in potash, and experience has confirmed this by the almost uniform failure of potassic manures on our soils. These fertilisers have been tried on various soils a large number of times, and it can be confidently stated that at the present time potash does not pay for its application for wheatgrowing in this State on any but very light sandy soils.

NITROGEN.

Nitrogen is absolutely essential to the growth of plants, and most soils contain but little naturally, for it washes so readily out of them. And in heavy rainfall countries it is necessary to replace this nitrogen by applications of nitrogenous manures, and by the growth of nitrogen-storing plants, if good crops of wheat are to be grown. This has not so far proved necessary, however, in the parts of this State where bare fallowing is carried out, because the warmth we experience encourages the activities of the nitrogen-storing bacteria present in the soil. In places where bare fallowing is not carried out, and where leguminous crops—the only nitrogen-storing plants—are not grown, some nitrogen should be put into the soil as a fertiliser. For this purpose ½cwt. to 1cwt. to the acre of nitrate of soda or sulphate of ammonia should be applied to the crop of wheat for the best results; failing these farmyard manure should be applied to the land to some crop preceding the wheat crop.

PHOSPHORIC ACID.

Phosphoric acid is an absolutely essential plant food, and South Australian soils show on analysis to be rather deficient in this important substance. The experience of our wheatgrowers carries this out, and from one end of this country to the other, to get anything like payable returns from wheat, it has been found necessary to apply phosphoric acid in some form or other as a fertiliser. The most successful manure in this direction has proved to be superphosphate of lime, but the ideal quantity to use varies with the particular local conditions. On the average where bare fallow-wheat is the practice, 1cwt. superphosphate

(36/38) gives the maximum profit over the expenditure; where bare fallow-wheat-pasture is carried out, and where a set rotation of crops is maintained, all of the crops being manured, 2cwts. per acre is the best application. Of the other common phosphatic manures none have so far proved equal to superphosphate, the basic slag, bonedust, and rock phosphate proving too slow of action.

Organic Matter.

Organic matter is not necessarily a manure, but it plays a very important part in the condition of the soil. It improves the condition of heavy soils and light sandy soils, making them more tractable; it helps the soil to absorb and retain moisture, and encourages, or, indeed, makes possible, the activities of the useful soil bacteria. Heavy soils without organic matter become unworkable, and light sandy soils blow away; so that the amount of this material in a soil should never be allowed to get low. The fertility of the soil also depends very largely on the proportion of organic matter it contains. The necessary amount for good fertility and good mechanical condition is kept in the soil by applications of farmyard manure, by ploughing in green crops and stubble, and by keeping and feeding livestock on the land.

Lime.

Lime is a plant food to a small degree, but is rarely that deficient in soils as to be necessary to apply it with this object. It is more important in that it plays a very great part in keeping the soil in good mechanical condition, and in making the soil a good medium for plants to live in. It counteracts excessive acidity of soils, a condition not conducive to the good growth of wheat. This acidity also prevents the formation of nitrates by the soil bacteria, as it is an unhealthy medium for bacteria, and there is no free base to combine with the nitrogen collected. It helps liberate potash for the use of plants, and also allows plants to make the full use of phosphates applied. Lime makes heavy clay soils much freer for cultivation by coagulating the particles, and improves the texture to some extent of light soils.

Position of the Wheat Crop.

Wheat is the most important crop grown, and so where a variety of crops is grown, including wheat, it should always have pride of place, which means that it should always take its turn when the soil is in the best heart. Wherever bare fallow is included in a rotation, wheat should be the crop that is sown on it, other crops following the wheat, not it following them. Where rotations of crops which do not include bare fallow are conducted, one of the crops should always be a leguminous crop, to return some nitrogen to the soil; and then the wheat

crop should follow the legume. When this is not done one crop should return much organic matter to the soil and another should be a "worked" crop, *i.e.*, grown in rows and cultivated during growth between the rows, and the wheat should follow this cultivated crop.

Depth of Seeding.

A point in wheatgrowing too often neglected in this State is the depth to which the seed is put into the land. It is too common to always put the lever of the drill at a certain notch, no matter whether the wheels of the machine sink into the land or not. That this depth of seeding is of importance was borne out by experiments conducted at Roseworthy Agricultural College. Here we found that the depth to sow wheat for the best results was from 1in. to 2in., a much less depth than is usually given to the seed. A full report of these experiments is to be seen in the *Journal of Agriculture* for August, 1911 to January, 1912.

Varieties.

There are hundreds of varieties of wheats, and as they have been evolved for the special conditions of different districts, it is only reasonable to expect that they will not be all equally suitable to any given district. This is certainly so, and in a locality where one variety may yield 30bush. per acre, there are hundreds that will not yield 10bush. per acre. The difference between individual varieties is so great that it is quite necessary for every grower to be certain that he is growing the one from which he is getting the greatest possible return. This cannot be done unless someone in the district—better if it is you—keeps on trying new varieties. Every year sees some good new varieties put on the market, and for years you may be growing a lot of what was the best variety for your conditions five years ago, whereas a new variety that would outyield your favorite by perhaps bushels per acre has come out. Of course, no one can possibly try under field conditions all the varieties he may hear of, but varieties that do well in conditions somewhat similar to your own are always worth trying. One acre for three consecutive years is all that is necessary to test promising varieties, and very often one season will show you that for some reason or other a variety is not worth a second thought.

THE AGRICULTURAL OUTLOOK.

REPORT FOR MONTH OF JANUARY.

The following reports on the general agricultural condition and outlook of the areas represented by the Government Experimental Farms mentioned below have been prepared by the respective managers:—

Booborowie.—Weather—The weather has been very unseasonable; thunderstorms have been very numerous, which have done much damage. The few hot days have been sultry and close, dewy mornings have been frequent. Crops—The reaping has been much delayed. Crops of the Federation variety are turning out well. Much wheat has been knocked out, and where crops are down the straw is black. Natural feed is plentiful. Stock is scarce and in good condition. Several losses in horse stock have occurred. Pests—Rabbits are increasing in numbers.

Eyre's Peninsula.—Weather—Changeable, with only a comparatively few real hot days. Three steady and comparatively light falls of rain were recorded, registering 87 points in all, a few points above the average for the past three years. Cool winds have been frequent. Some thundery weather was recorded, but no damaging storms broke in the near vicinity. Crops—Owing to unfavorable harvest weather and lodged condition of crops, harvesting is not yet completed. Yields are averaging better than anticipated; on fallow wheat is averaging over 30bush., as also on new scrub land, whilst the bulk of stubble land is returning 25bush. Wheat-carting is in operation. Natural feed is still in abundance. Stock—Another case of strangles has occurred. Pests—Field mice are very plentiful, but as yet have confined their actions chiefly to burrowing under and around the wheat stacks.

Kybybolite.—Weather—Forty-five points of rain fell on the 22nd, following a hot week; apart from this the weather has been fine and cool. Crops—Harvesting operations are well forward, and wheat carting is general. The heavier-looking wheat crops have not generally come up to expectations, some being 6bush. and 7bush. under previous estimates. Up to 20bush. the estimates were fairly correct, and the district average should be around 14bush. or 15bush. The kale crops sown in early summer are making good headway. Natural feed is still very plentiful. Stock are in fair to good condition. Pests—The Rutherglen fly has been playing havoc with the fruit and vegetables during the past two or three weeks, but has pretty well left us again now. Miscellaneous—Sorrel is making great headway this season; there has been a luxuriant growth on fallows, and it is showing up prominently in the stubbles.

Turretfield.—Weather—Seasonable weather prevailed during the month of January, temperatures varying from warm to hot. The rainfall for the month totalled 55 points, of which 50 points fell on the 22nd. As this fall was accompanied by heavy wind, considerable damage was done to the standing crops. Crops—Harvesting operations are now nearing completion. Stripping has been somewhat difficult, owing to the crops being down in parts, and a fair percentage of grain was past recovering, because of the fact that the heads had been broken off short by the wind. Natural feed, though dry, is still plentiful. All stock is in fair condition. Pests—Rabbits are fortunately scarce. Miscellaneous—A considerable quantity of hay is still lying in the fields, but with stripping nearly completed farmers hope to get it carted in the near future.

Veitch.—Weather—Rainfall for month, 45 points; Veitch average, 35 points. A few warm days were experienced during this month, but not enough to suit harvesting operations. Crops—Crops are returning even better yields than were expected, and in most cases there is a shortage of cornsacks. A fortnight will finish the stripping on the majority of farms in this district. Natural Feed—The late summer rains are providing good scrub greenfeed. Stock are all in splendid condition. Miscellaneous—Wheat-carting teams are arriving at the Veitch Station, and the sample of wheat brought in is a very good one.

DAIRY AND FARM PRODUCE MARKETS.

A. W. Sandford & Co., Limited, report on February 1st:—

Butter.—The shortening in supplies referred to a month ago continues, though not so rapidly as during the last few seasons. Seconds and thirds are still being produced in excess of local requirements, and they are finding market overseas, where values have receded somewhat, owing to the arrival of big quantities from Australia and New Zealand. This State is therefore importing from the east for tops, and local rates, in prints, at the close of the month, are "Alfa," 1s. 6½d.; "Primus," 1s. 6½d.; choice separators and dairies, 1s. 4d. to 1s. 5d.; fair quality, 1s. 2d. to 1s. 3d.; well-conditioned store and collectors', 1s. 1d. to 1s. 2d.; weather-affected lots, 1s. to 1s. 0½d. per lb.

Eggs.—During the early part of January supplies of eggs were very heavy, and prices eased somewhat; but towards the end of the month rates were again firmer, hen selling at 8d.; duck, 9½d. per dozen.

Cheese.—Large forwardings were recorded, but the floors were kept nicely cleared with the help of interstate orders, values being from 7½d. to 8½d. per lb. for large to loaf.

Honey.—Supplies are very short of trade requirements, all consignments meeting with ready quittance at improved rates, viz., prime clear extracted, 3¾d. to 4d. per lb.; beeswax wanted at 1s. 6d. per lb.

Almonds.—Last season's practically exhausted, and buyers are already inquiring for the new crop. Prices nominally—Brandis, 10d.; mixed softshells, 9d.; hardshells, 5d.; kernels, 1s. 7d. per lb.

Bacon.—Good demand continues for this line, with values showing a firming tendency. Best factory-cured sides, 11½d. to 1s. 0½d. per lb.; hams, 1s. 1d. to 1s. 2d. per lb.

Live Poultry.—Competition throughout the month has been very active, especially for quality lots, and although there is a good proportion of light birds coming forward, still fair rates are secured. Heavyweight table roosters, 3s. 6d. to 4s. each; nice-conditioned cockerels, 2s. 9d. to 3s. 6d.; plump hens, 2s. 6d. to 3s.; light birds, 1s. 9d. to 2s. 3d.; ducks, 1s. 8d. to 3s.; geese, 3s. 3d. to 4s.; pigeons, 6½d. each; turkeys from 11d. to 1s. 1d. per lb. live weight for fair to prime table birds.

Potatoes and Onions.—There has been no diminution in the supply of locally grown potatoes, and dealers have found it exceedingly difficult to keep the market clear of all that have been offering. The bulk of the potatoes coming to hand are the Pinkeye variety, which, unfortunately, are not suitable for long-distance trade when dug in warm weather. In the Gambier district potato growers are anxious for orders, so that there is no immediate prospect of any advance in price. Onions.—Thanks to a temporary demand by interstate buyers, we have to report an improvement in the onion market, and although buyers for export have now ceased to operate, local inquiry continues to keep the market cleared. Quotations.—Potatoes, £3 10s. to £4 10s. per ton on rails Mile End or Port Adelaide. Onions, £6 10s. to £7 per ton on rails Mile End or Port Adelaide.

RAINFALL TABLE.

The following figures, from data supplied by the Commonwealth Meteorological Department, show the rainfall for the month of and to the end of January, 1917, also the average precipitation to the end of January, and the average annual rainfall.

Station.	For Jan., 1917.	To end Jan., 1917.	Av'ge. to end Jan.	Av'ge. Annual Rainfall
Far North and Upper North.				
Oodnadatta	2·06	2·06	0·66	4·76
Warrina	1·29	1·29	0·28	—
Tarcoola	2·16	2·16	0·24	7·58
Hergott	1·06	1·06	0·46	6·04
Farina	1·04	1·04	0·52	6·70
Leigh's Creek	1·82	1·82	0·65	8·66
Beltana	2·50	2·50	0·70	9·22
Blinman	2·02	2·02	1·05	12·83
Wilgena	—	—	0·45	—
Hookina	4·80	4·80	0·27	—
Hawker	4·45	4·45	0·51	12·22
Wilson	3·54	3·54	0·59	11·78
Gordon	5·13	5·13	0·37	10·26
Quorn	3·24	3·24	0·59	13·78
Port Augusta	1·79	1·79	0·53	9·46
Port Augusta W.	1·97	1·97	0·47	9·36
Bruce	3·27	3·27	0·34	10·01
Hammond	2·89	2·89	0·61	11·46
Wilmington	3·39	3·39	0·81	18·26
Willowie	3·40	3·40	0·36	11·90
Melrose	4·17	4·17	1·25	23·04
Booleroo Centre	3·33	3·33	0·77	15·83
Port Germein	1·85	1·85	0·63	12·84
Wirrabara	2·65	2·65	0·64	18·91
Appila	2·26	2·26	0·61	15·08
Cradock	4·03	4·03	0·55	10·86
Carrieton	3·90	3·90	0·75	12·22
Johnburg	3·42	3·42	0·54	10·21
Eurelia	4·27	4·27	0·69	13·24
Orroroo	3·67	3·67	0·99	13·42
Black Rock	3·46	3·46	0·67	12·25
Petersburg	3·38	3·38	0·78	13·07
Yongala	3·52	3·52	0·61	13·94
Oakden Hills	—	—	0·42	—
Coondambo	—	—	0·65	—
Wirraminna	3·02	3·02	0·24	—
North-East.				
Ucolta	2·72	2·72	0·59	—
Nackara	4·00	4·00	—	—
Yunta	3·42	3·42	0·65	8·22
Waukaringa	2·67	2·67	0·49	7·94
Mannahill	2·51	2·51	0·64	8·46
Cockburn	2·54	2·54	0·68	7·97
Broken Hill, NSW	3·54	3·54	0·69	9·63
Lower North.				
Port Pirie	1·83	1·83	0·59	13·21
Port Broughton	0·57	0·57	0·64	14·33
Bute	0·60	0·60	0·65	15·42
Laura	1·69	1·69	0·70	18·22
Caltowie	1·64	1·64	0·66	17·27
Jamestown	1·63	1·63	0·64	17·46
Gladstone	1·40	1·40	0·64	16·00
Crystal Brook	1·34	1·34	0·62	15·62
Georgetown	1·80	1·80	0·64	18·32
Narridy	1·11	1·11	0·58	16·79
Lower North—*continued.*				
Redhill	1·86	1·86	0·53	16·79
Spalding	1·14	1·14	0·47	20·25
Gulnare	1·16	1·16	0·53	19·74
Bundaleer W. Wks.	1·33	1·33	0·43	17·29
Yacka	0·98	0·98	0·49	15·27
Koolunga	1·12	1·12	0·57	15·94
Snowtown	0·80	0·80	0·62	15·70
Brinkworth	1·27	1·27	0·35	15·48
Blyth	0·92	0·92	0·66	16·34
Clare	1·26	1·26	0·86	24·30
Mintaro Central	1·33	1·33	0·53	21·99
Watervale	1·77	1·77	0·88	27·17
Auburn	1·64	1·64	1·00	24·25
Hoyleton	1·52	1·52	0·77	17·96
Balaklava	0·49	0·49	0·70	16·03
Port Wakefield	1·57	1·57	0·56	13·13
Terowie	2·90	2·90	0·67	13·71
Yarcowie	2·64	2·64	0·67	13·91
Hallett	1·31	1·31	0·73	16·40
Mount Bryan	1·12	1·12	0·46	15·73
Burra	0·68	0·68	0·78	17·82
Farrell's Flat	0·50	0·50	0·78	18·87
West of Murray Range.				
Manoora	1·16	1·16	0·54	18·09
Saddleworth	1·31	1·31	0·77	19·69
Marrabel	1·18	1·18	0·72	18·94
Riverton	1·88	1·88	0·73	20·48
Tarlee	0·51	0·51	0·79	17·48
Stockport	0·45	0·45	0·79	15·89
Hamley Bridge	0·54	0·54	0·82	16·45
Kapunda	0·75	0·75	0·86	19·67
Freeling	0·50	0·50	0·77	17·85
Greenock	0·60	0·60	0·76	21·46
Truro	0·94	0·94	0·74	19·74
Stockwell	0·78	0·78	0·73	20·30
Nuriootpa	0·85	0·85	0·78	21·25
Angaston	0·85	0·85	0·76	22·25
Tanunda	0·34	0·34	0·84	22·28
Lyndoch	0·68	0·68	0·74	23·01
Williamstown	0·64	0·64	0·90	—
Adelaide Plains.				
Mallala	0·55	0·55	0·77	16·88
Roseworthy	0·76	0·76	0·75	17·31
Gawler	0·78	0·78	0·72	19·21
Two Wells	0·45	0·45	0·72	16·36
Virginia	0·42	0·42	0·75	17·58
Smithfield	0·61	0·61	0·50	17·30
Salisbury	0·36	0·36	0·74	18·57
North Adelaide	0·49	0·49	0·76	21·49
Adelaide	0·44	0·44	0·72	21·04
Seaton (Grange)	0·33	0·33	—	—
Brighton	0·34	0·34	0·58	—
Glenelg	0·38	0·38	[illegible]·63	—
Magill	0·48	0·48	0·83	19·93
Unley	0·50	0·50	—	18·35

RAINFALL—*continued.*

Station.	For Jan., 1917	To end Jan., 1917.	Av'ge. to end Jan.	Av'ge. Annual Rainfall
ADELAIDE PLAINS—*continued.*				
Rose Park	0·46	0·46	—	25·69
Paradise	0·46	0·46	—	—
Glen Osmond	0·52	0·52	1·00	25·26
Mitcham	0·45	0·45	0·85	23·47
Belair	0·50	0·50	1·00	28·64
MOUNT LOFTY RANGES.				
Teatree Gully	0·46	0·46	0·78	28·19
Stirling West	1·06	1·06	1·49	46·70
Uraidla	0·94	0·94	1·30	44·35
Clarendon	0·46	0·46	1·13	33·67
Morphett Vale	0·25	0·25	0·82	23·32
Noarlunga	0·27	0·27	0·62	20·28
Willunga	0·36	0·36	0·75	25·98
Aldinga	0·16	0·16	0·54	20·34
Myponga	0·34	0·34	—	—
Normanville	0·31	0·31	0·57	20·65
Yankalilla	0·21	0·21	0·51	22·78
Cape Jervis	0·10	0·10	0·42	16·34
Mount Pleasant	0·69	0·69	0·81	26·87
Blumberg	0·49	0·49	1·12	29·38
Gumeracha	0·62	0·62	1·08	33·30
Millbrook Reservr.	0·64	0·64	—	—
Lobethal	0·60	0·60	1·02	35·38
Woodside	0·56	0·56	0·98	31·87
Hahndorf	0·28	0·28	1·05	35·45
Nairne	0·52	0·52	0·97	28·83
Mount Barker	0·62	0·62	1·02	30·93
Echunga	0·64	0·64	1·07	32·83
Macclesfield	0·67	0·67	0·88	30·72
Meadows	0·76	0·76	1·03	35·52
Strathalbyn	0·46	0·46	0·70	19·28
MURRAY FLATS AND VALLEY.				
Wellington	0·37	0·37	0·80	15·01
Milang	0·32	0·32	0·67	16·08
Langhorne's Brdg	0·38	0·38	0·46	15·27
Tailem Bend	0·96	0·96	0·36	—
Murray Bridge	0·28	0·28	0·61	14·32
Callington	0·39	0·39	0·73	15·65
Mannum	0·58	0·58	0·53	11·67
Palmer	0·50	0·50	0·44	15·60
Sedan	0·82	0·82	0·53	11·92
Swan Reach	0·44	0·44	0·37	—
Blanchetown	0·32	0·32	0·55	—
Eudunda	0·50	0·50	0·75	10·71
Sutherlands	0·44	0·44	0·31	17·33
Morgan	0·42	0·42	0·49	10·60
Waikerie	0·55	0·55	0·24	9·29
Overland Corner	0·30	0·30	0·52	11·42
Renmark	0·54	0·54	0·45	10·93
Loxton	1·05	1·05	—	—
WEST OF SPENCER'S GULF.				
Eucla	0·47	0·47	0·63	10·13
White Well	1·32	1·32	0·43	9·67
Fowler's Bay	0·75	0·75	0·40	12·11
Penong	0·98	0·98	0·26	11·93
Murat Bay	1·31	1·31	0·14	—
Smoky Bay	1·13	1·13	—	—
Petina	1·62	1·62	0·19	—
Streaky Bay	1·25	1·25	0·44	15·31

Station.	For Jan., 1917	To end Jan., 1917.	Av'ge. to end Jan.	Av'ge. Annual Rainfall
WEST OF SPENCER'S GULF—*continued.*				
Talia	1·51	1·51	—	—
Port Elliston	0·65	0·65	0·37	16·49
Cummins	0·42	0·42	—	—
Port Lincoln	0·66	0·66	0·60	19·88
Tumby Bay	0·35	0·35	0·12	15·00
Carrow	0·69	0·69	—	—
Arno Bay	0 70	0·70	0·13	—
Cowell	1·15	1·15	0·41	11 76
Point Lowly	1·69	1·69	0·43	12·21
Cleve	0·95	0·95	0·43	—
Hummock Hill	2·24	2·24	0·32	—
YORKE'S PENINSULA.				
Wallaroo	0·35	0·35	0·56	14·05
Kadina	0·29	0·29	0·52	15·88
Moonta	0·24	0·24	0·54	15·22
Green's Plains	0·45	0·45	0·51	15·73
Maitland	0·46	0·46	0·61	20·08
Ardrossan	0·42	0·42	0·52	13·89
Port Victoria	0·33	0·33	0·47	15·20
Curramulka	0 37	0·37	0·60	18·51
Minlaton	0·23	0·23	0·49	17·41
Port Vincent	0·28	0·28	0·43	—
Stansbury	0·11	0·11	0·61	17·06
Warooka	0·28	0·28	0·43	17·71
Yorketown	0·12	0·12	0·49	17·47
Edithburgh	0·17	0·17	0.51	16·48
SOUTH AND SOUTH-EAST.				
Cape Borda	0·31	0·31	0·65	25·09
Kingscote	0·30	0·30	0·43	18·95
Penneshaw	0·15	0·15	0·62	21·34
Cape Willoughby	0·24	0·24	0·71	19·69
Victor Harbor	0·28	0·28	0·75	22·18
Port Elliot	0·31	0·31	0·68	20·33
Goolwa	0·35	0·35	0·66	17·93
Pinnaroo	0·66	0·66	0·32	16·74
Parilla	0·82	0·82	—	—
Lameroo	0·93	0·93	0·49	16·55
Parrakie	0·45	0·45	0·37	—
Geranium	0·39	0·39	—	—
Peake	0·63	0·63	0·47	—
Cooke's Plains	0·34	0·34	0·56	14·74
Coomandook	0·39	0·39	0·50	—
Meningie	0·28	0·28	0·66	17·49
Coonalpyn	0·33	0·33	0·72	16·80
Tintinara	0·41	0·41	0·48	18·78
Keith	0·35	0·35	0·33	—
Bordertown	0·88	0·88	0·76	19·76
Wolseley	0·40	0·40	0·57	17·72
Frances	0·78	0·78	0·70	20·74
Naracoorte	0·64	0·64	0·82	22·60
Penola	0·45	0·45	1·06	26·78
Lucindale	0·67	0·67	0·72	23·32
Kingston	0·40	0·40	0·73	24·73
Robe	0·57	0·51	0·78	24·69
Beachport	0·33	0·33	0·91	27·51
Millicent	0·40	0·40	0·99	29·25
Mount Gambier	0·46	0·46	1·43	32·00
C. Nrthumberland	0·28	0·28	0·88	26·63
Kalangadoo	0·57	0·57	—	18·87

AGRICULTURAL BUREAU REPORTS.

INDEX TO CURRENT ISSUE AND DATES OF MEETINGS.

INDEX TO AGRICULTURAL BUREAU REPORTS—*continued.*

Branch.	Report on Page	Dates of Meetings. Feb.	Dates of Meetings. Mar.
Mindarie	578	5	5
Minlaton	*	2	9
Minnipa	578	10	10
Mintaro	*	3	3
Mitchell	*	—	—
Monarto South	*		—
Monteith	*	—	—
Moonta	*	—	—
Moorlands	*	—	—
Morchard	*	—	—
Morgan	*	—	—
Morphett Vale	*	—	—
Mount Barker	587-8	7	7
Mount Bryan	*	—	—
Mount Bryan East	*	—	—
Mount Compass	†	—	—
Mount Gambier	*	—	—
Mount Hope	*	—	—
Mount Pleasant	*	—	—
Mount Remarkable	*	—	—
Mundalla	592	14	14
Mundoora	*	—	—
Murray Bridge	579	—	—
Mypolonga	*	—	7
Myponga	*	—	—
Myrla	*	—	—
McNamara Bore	*	—	—
Nantawarra	*	—	—
Naracoorte	593	—	—
Narridy	*	—	—
Narrung	*	—	—
Netherton	*	—	—
North Booborowie	*	—	—
North Bundaleer	*	—	—
Northfield	*	6	6
Orroroo	576	—	—
Parilla	*	1	8
Parilla Well	*	—	—
Parrakie	*	—	—
Paskeville	*	—	—
Penola	*	—	—
Penong	*	10	10
Petina	*	—	—
Pine Forest	*	—	—
Pinnaroo	*	—	—
Pompoota	†	—	—
Port Broughton	*	—	—
Port Elliot	*	17	17
Port Germein	*	—	—
Port Pirie	*	3	3
Quorn	*	3	3
Ramco	*	—	—
Redhill	*	—	6
Renmark	*	—	—
Riverton	*	—	—
Roberts and Verran	*	—	—
Rosenthal	*	—	—
Rosy Pine	*	—	—
Saddleworth	*	—	—
Salisbury	*	—	—
Salt Creek	*	—	—
Sandalwood	589	—	—
Sherlock	579	—	—
Spalding	*	—	—
Stirling's Well	†	3	—
Stockport	*	—	—
Strathalbyn	591	6	6
Sutherlands	*	—	—
Tantanoola	*	1	1
Tarcowie	*	—	6
Tatiara	†	—	3
Tintinarra	*	—	—
Two Wells	*	—	—
Uraidla and Summert'n	*	—	5
Waikerie	579-80	—	30
Warcowie	*	—	—
Warrow	*	—	—
Watervale	*	—	—
Wepowie	577	3	3
Whyte-Yarcowie	*	—	—
Wilkawatt	*	—	—
Willowie	*	6	6
Wilmington	*	—	—
Wirrabara	577	—	—
Wirrega	*	—	—
Wollowa	*	—	—
Woodleigh	*	—	—
Woodside	*	—	—
Wynarka	*	—	—
Yabmana	*	—	—
Yacka	*	—	—
Yadnarie	*	—	—
Yallunda	*	—	—
Yaninee	*	—	—
Yeelanna	578	—	—
Yongala Vale	*	5	5
Yorketown	*	—	—

*No report received during the month of January. * Formal report only received.
† Held over until next month.

ADVISORY BOARD OF AGRICULTURE.

Dates of Meetings—February 14th, and March 14th, 1917.

THE AGRICULTURAL BUREAU OF SOUTH AUSTRALIA.

Every producer should be a member of the Agricultural Bureau. A postcard to the Department of Agriculture will bring information as to the name and address of the secretary of the nearest Branch.

If the nearest Branch is too far from the reader's home, the opportunity occurs to form a new one. Write to the department for fuller particulars concerning the work of this institution.

REPORTS OF BUREAU MEETINGS.

UPPER-NORTH DISTRICT.

(PETERSBURG AND NORTHWARD.)

ORROROO (Average annual rainfall, 13.42in.).

December 9th.—Present: 14 members.

DRYING FRUIT.—The outfit required for fruit drying, remarked Mr. J. J. Dennis, in a paper on that subject, were trays, a bleacher, a good knife, a few boxes, an old bucket or half a kerosine tin, and a few pounds of sulphur. The tray could be made of laths or matchboard. He preferred the latter, because it was better to handle, and had fewer splinters. A handy size was 5ft. 6in. x 2ft. 9in., made with a narrow ledge around the top, and pieces about 1½in. wide at the ends, underneath, to keep the tray, when stacked, clear of the fruit in the tray underneath. The bleacher required a strong frame, 6ft. x 3ft. and 5ft. 6in. in height, with handles at the ends like a hand barrow. The frame should be covered with 1½in. netting, and then over all ruberoid. All joints should be air tight, and only the bottom open. The number of trays required could be ascertained by allowing two for each case of fruit, and it would be a week before the drying operations were completed, and the trays could be used again. In drying peaches, pears, and apricots, the fruit should be nicely ripe, but not at all over ripe, otherwise it became "squashy," and did not dry nicely. The fruit should be cut in half with a knife, the stones removed, and then laid skin downwards on the tray, but so that there was so overlapping. The trays should be stacked on two low boxes to the height of 10 or 12 trays. A few handfuls of sulphur should be put in a tin or bucket with some live coals and placed under the trays. The bleacher should be placed over the trays, and dirt heaped around the bottom to prevent the fumes escaping. After two and a half or three hours, the bleacher could be removed and the trays arranged side by side in the sun. They should be stacked up at night if at all damp. In about four days the fruit should be turned, an operation easily performed by two men with a spare tray and a couple of small jams, made to fit nicely over the edge on the trays when one was placed upside down on top of the other. As soon as that had been fixed the trays should be turned over, the jams and the top tray removed, and so on, until all had been treated. In a week, or perhaps less, the fruit might be fit to take in. It should be an amber color, just nice and tough, and not sticky or "squashy." Raisins and sultanas, as soon as gathered, should be placed in a wire bucket and dipped in a solution of boiling water and caustic soda (about 1¼lbs. of caustic soda to 18galls. of water). The berries should be left in until the skin commenced to show small cracks, when it should be tipped out on to the trays and put out to dry. After one and a half days they should be turned and left another two days, when they should be rubbed off the stems, cleaned, and boxed. The right time for packing away was when the berries felt nice and springy, and did not stick together. If sticky they should be placed in the sun for a few hours, and then stacked up to cool for a couple of hours, when they could be rubbed off the stems and boxed. Currants might be dried on wire netting frames (6ft. x 3ft.) made from 3in. x 1½in. timber and ½in. wire netting. Currants could also be dried on sheets of iron, because they required no other treatment than the sun drying. The berries should not be broken in picking or allowed to get dirty. If a wire tray were used turning would be unnecessary, but if a board tray were preferred it would be necessary to turn the currants just the same as other

fruit. When thoroughly dry the berries would rub off the stems very easily. In large gardens a table shaped something like a trough was used with ½in. wire netting along the bottom. Boxes were placed underneath, and the currants rubbed into them. In small gardens they were rubbed by hand on a tarpaulin and winnowed through an ordinary wheat winnower with a ⅜in. mesh sieve. That blew away the stems and graded out the big berries.

WEPOWIE, December 16th.—An address was given by Mr. J. Crocker on methods of harvesting, in which he advocated the use of the harvester where the cocky chaff was not required, but he preferred the stripper in the North. A light windmill could be constructed to turn the winnower. He preferred obtaining a new comb for the stripper to having the old one closed, because the latter always lost wheat. In the discussion which ensued, members expressed a preference for the harvester. Mr. F. Roocke said that, in the paddock where he cut for heading last year, he had during the present year secured a good crop of self-sown hay, a proof, he thought, that much wheat was wasted in heading.

MIDDLE-NORTH DISTRICT.

(PETERSBURG TO FARRELL'S FLAT.)

WIRRABARA, December 9th.—Mr. F. C. Carson read a paper on the use and value of the roller, and said that the roller should always work in front of the drill in order to press the ground and level it so that all the seed might be sown to the same depth. When the wheat was from 6in. to 12in., or even 15in. high, it should be rolled, because the roller took with it some of the flag, which acted like pruning to the plant. It also destroyed grubs. After rolling it was possible to cut much lower with the binder, thus securing more hay, and doing less damage to the binder knives. Whether the land was light or heavy rollers could do very profitable work in preparing land for wheat, especially land broken up late in the season. All land intended for wheat, and broken up after July rains should be heavily rolled as soon after ploughing as possible, and the beneficial result could be measured in bushels at harvest.

LOWER-NORTH DISTRICT.

(ADELAIDE TO FARRELL'S FLAT.)

FREELING, November 9th.—A paper was read by Mr. G. E. Roberts on harvesting machinery, and the discussion which ensued related to the merits and shortcomings of various makes of harvesters and the relative merits of harvesters and strippers, and winnowers.

WESTERN DISTRICT.

KOONIBBA, January 4th.—Mr. M. J. Foggo read a paper on the cultivation of the soil for wheatgrowing in that district. He urged ploughing to a depth of 3in. and then the ground should be harrowed as much as possible, especially after rain. As much land as possible should be fallowed early in June or July, while the ground was wet. If weeds appeared a tine cultivator should be used. In the discussion which followed some members contended that fallow was not as successful in that district as had been claimed in other districts, because the land always drifted badly, no matter how or when ploughed. In the present season fallow land was giving no better results than land which had been ploughed just before seeding. Other members claimed that fallow had proved most successful.

YEELANNA, January 13th.—Mr. T. A. Proctor read a paper entitled "Poultry on the Farm," in which he urged the necessity for proper attention to the housing, feeding, and breeding of fowls. Farmers sometimes purchased a stock of fowls, which, in new quarters with a good run and all the natural herbage and food they required, did well, but from lack of care and management and in-breeding, they deteriorated, and became weaklings, among which disease broke out and did great damage. In such cases a fresh start should be made, and with proper attention the poultry would pay. Members generally agreed with the views contained in the paper, a preference being expressed for the white Leghorn, because of its splendid laying qualities.

MINNIPA, December 9th.—Mr. G. V. Lindquist delivered a short address on fire breaks, in which he advised clearing a half-chain break for scrub and a quarter-chain for stubble, ploughing a furrow each side of the break, and burning the intervening grass or stubble. Breaks should be made around wheat heaps and stacks by removing the loose straw and litter with a horserake. Mr. A. J. Godlee recommended the employment of many hands when burning scrub. Whirlwinds were of frequent occurrence when a south-east breeze was blowing. Mr. J. M. Casey expressed the opinion that the shovel was the best implement for extinguishing fires. Mr. S. C. North advised burning breaks at the end of winter, before the crops came into ear. Mr. Elefson said that Mr. North's suggestion entailed too much work. It was important to have a north wind for scrub burning.

EASTERN DISTRICT.

(EAST OF MOUNT LOFTY RANGES.)

MINDARIE.

November 20th.—Present: nine members.

Rotation of Crops and Hand Feeding of Stock.—The two subjects, the rotation of crops and hand feeding of stock, had been dealt with together, remarked Mr. J. S. Johnston in an interesting paper, because they were partly dependent on each other for success. To grow wheat successfully, he continued, a farmer must, after the first two or three crops, adopt some other rotation crop, and have stock. It was best to grow a crop of different feeding habits, and a crop that would starve out takeall. The only crop which could be sown over a large area was oats. A system practised at Pinnaroo, and to his mind, the best, was to crop with wheat the first year, oats the second year, bare fallow the third year, and continue that rotation. In most cases it was only necessary to drill the oats in with about 25lbs. or 30lbs. of super. In the system indicated two-thirds of the farm were under crop, and one-third under fallow. That kept the land clean and free from takeall, and good burning off was obtainable where necessary. Where the country was light and of a very sandy nature, oats were practically the only means a mallee farmer had of getting a good burn, and ridding his farm of shoots, because wheat would only grow thinly on sand, and had very little flag. To some it was a problem what to do with all the oats grown under that system, because there was only a limited market for them. Oats, however, made an excellent sheep feed, fattening them, and causing a fine growth of wool. That solved the difficulty of the disposal of the oats. It had been demonstrated that 1lb. of hay or straw chaff, with a little oats, or 2lbs. of oaten chaff per day was quite sufficient for a sheep to thrive on and grow a good fleece. On that basis 170 tons of hay chaff with oats would keep 1,000 sheep, if hand fed all the year round, but it was not probable that it would be necessary for so long a period. For fully three months of the year the sheep would be grazing down the fallow and living on the stubble, and therefore the hay, chaff, and oats required would be considerably—approximately 25 per cent—less than 170 tons. Where the land was heavy sand he would not harvest the oats, but would turn the sheep on them and save hauling the machinery. He would strip the oats he required for grain into heaps, and cover over with straw until wanted, thus saving bags and cleaning. He would save all cocky chaff from the wheat to mix with the oats to

provide bulk. Some of the oats and wheaten straw could be cut for hay. By adopting that system the number of sheep in the State could be almost doubled. An ordinary mallee farm would keep 600 sheep (a low estimate for hand feeding). At the present time they would cut 10s. worth of wool, and produce, say, 80 per cent. of lambs at £1 per head, thus giving a return of £780 from that flock. To keep more sheep still, if the labor were available, the wheat could be cut and headed, and the straw used for feeding stock. Wheat should be grown only on well-worked fallow, and oats for feeding stock on the stubble. The poultry yard should pay household expenses and a little over, and a few pigs should be kept. In fact, most of the produce should walk off the farm, thus overcoming long distance carting and heavy roads. The only difficulty was financing the start, but with that accomplished the road to success, on those lines, was assured. Mr. R. Shannon considered that new land might successfully carry two crops of wheat and one or two of oats, in succession, but a third crop of wheat would be too much. Mr. J. W. G. Mann said that his land, which had produced oats the previous year was not producing anything like the crop which land alongside, on which wheat was grown the previous year, was producing. Mr. R. C. Payne considered oat growing indispensable to successful farming in the mallee. In his opinion 50lbs. to 60lbs. of super. should be used. Mr. E. L. Parker declared that the soil in that district would not stand well-worked fallow. He advocated shallow ploughing, not more than 2in. in depth, and then left until seed time. He would not work the sandhills. Mr. M. A. Francis believed in sowing fodder crops and feeding them off with sheep because of the enrichment of the soil that resulted.

BERRI, January 3rd.—Mr. W. R. Lewis read a paper on fruit drying, which was discussed extensively. The cup presented by the Branch for the best-kept orchard was awarded to Messrs. Pennyfield Bros., who scored 84 points out of 100. Mr. B. Arndt was second, with a score of 80, and Mr. B. Kurtz third with a score of 78. The marks were apportioned as follows:—Lay out, 15; pruning, 25; ploughing, 10; cultivation and irrigation 30; growth and appearance 15; general neatness in care of harness, fowlhouses, flower or vegetable garden, 5. There were 21 competitors. The principal failing was in cultivation.

MANTUNG, December 7th.—Mr. W. Stewart introduced a discussion on the stripper. He raised the question as to the height the beaters should be from the comb. Mr. Hammond said that he had secured good results from fixing the beaters ½in. from the comb, and 1in. from the thrashing plate. Mr. G. N. Baker said that it was merely a matter of opinions and machines; different machines requiring different setting of the beaters. Mr. H. W. Lehmann considered that the man driving the stripper should experiment. If the machine was cutting cleanly and thrashing well it was best to leave it as it was. If the beaters did not cut the head off they should be set down a trifle, but not low enough to cause them to "knock." An aid to thrashing was to insert a row of horseshoe nails just above the thrashing plate.

MURRAY BRIDGE, December 7th.—Mr. F. E. Place, the Government Veterinary Expert, delivered an address entitled "Udder Ills of Cows," and was accorded a hearty vote of thanks. On November 11th a visit was paid to Mount Barker, and members were shown the process of leather making at Messrs. T. Paltridge & Son's tannery. Subsequently they were conducted over Messrs. Pope Bros.' farm on the Echunga Road, where a considerable time was spent, and lunch was served. The next halting place was "Dalebank," Mr. Leslie Cowan's residence, at Blakiston, where the Jersey herd was inspected. Afternoon tea was served, and the party then returned home.

SHERLOCK, December 30th.—After the business of the annual meeting Mr. T. Partridge read an article by Mr. A. V. Richardson (Victorian Superintendent of Agriculture). Mr. R. F. Mayfield also read a paper.

WAIKERIE, December 15th.—Mr. V. S. Brown read a paper on marketing fresh fruit, and pointed out that river growers could not expect the best returns under existing conditions. Cool cars were not provided on the Waikerie line. Fruit was all day on the journey, and consignees could not obtain delivery until the following morning. Mr. Ross emphasized the necessity for consignees of fresh fruit securing delivery the same evening on which it arrived in the city.

WAIKERIE, January 5th.—Mr. A. G. Ifould read a paper on dairying, in which he urged the necessity for selecting a good milking strain, a pure-bred bull being the essential foundation of the herd. All cows should be tested, and the unprofitable ones sent to the butcher. He preferred the milking Shorthorn crossed with the Jersey or Ayrshire. Cleanliness was imperative. In the discussion which ensued some members declared that dairying was unprofitable unless child labor was employed. Others held that at present prices for butter a suitable system of irrigation for growing lucerne combined with dairying, pig raising, and a small fruit garden would pay a family man.

SOUTH AND HILLS DISTRICT.

BLACKWOOD (Average annual rainfall, 27in. to 29in.).

December 18th.—Present: 12 members.

FIRE BLIGHT.—Mr. C. G. Savage, manager of the State Experimental Orchard, read a paper on fire blight, as follows:—"The term 'fire blight' as commonly applied in this State covers many diseases and disorders; in fact, wherever a tree becomes defoliated or the leaves dry during the growing period, no matter from what cause, the trouble is termed 'fire blight' by many orchardists. The main cause of the trouble of what is more accurately termed fire blight in this State is due to the 'shot hole' fungi mainly (*Clasterosporium carpophilum*). At times growers are apt to question this statement, because, on reading American literature, 'fire blight' is found to be caused by a bacteria (*Bacillus amylovorus*, Burl.), and not by a fungus. A short note on this disease may be of interest, as it is one of the worst enemies with which growers of pears have to contend. The disease becomes such a scourge that the importation of pear trees from the United States of America into the Commonwealth is absolutely prohibited to prevent the introduction of the disease into this country. The disease may be confined to one or two limbs, or may spread through the whole tree. The affected portion soon dies and blackens, rifts occur in the bark through which gum exudes, carrying with it the germs of the trouble. Insects are attracted by the gum, and by the means of these busy creatures the germs are carried away to the opening pear blossoms, where they rapidly grow and multiply in the nectar of the flowers. Infection of the tree takes place by the disease entering through the flower, down the flower stalk, and then to the tender shoots of the tree; or germs may be blown by the wind on to the young shoots, and the tree soon becomes diseased. The spread of the trouble varies with the season, and, as in the case of fungi, the disease is worse in a damp spring than in a dry one, but after the germs become deeply seated in the tissues of the tree the rainfall has not so much influence upon its growth as the temperature. There are three main points of attack, viz., flower, opening leaf buds, and any exposed tissue upon the stem or limbs. Hence there have arisen many forms of 'fire blight' such as 'flower blight,' 'leaf blight,' and 'body blight,' but all are caused by the same organism, the only difference being the place of attack. When the disease attacks the apple tree, the infection usually takes place through the flower, but does not make much progress, only a few inches of the lateral bearing the flowers being destroyed. Sometimes the whole crop is lost, but usually only a thinning of the fruit takes place. The germ is very small, and is supplied with a whiplash-like mobile organ by means of which it can move. There is no definite remedy for controlling this 'fire blight,' the usual practice being to cut the affected portion of the tree well below the diseased area, and to burn the cuttings. The life history of the 'shothole fungus' (*Clasterosporium carpophilum*) is somewhat as follows:—The spores are scattered over the trees, and germinate as soon as sufficient moisture has fallen to wet them through. That usually takes place in the early autumn. Spores lying on the tender bark of the new wood germinate and penetrate into the young tissue, causing characteristic spotting by the mycelium of each spore killing a small area of bark. The spores lying on the bud scales send their mycelium into the bud, and generally kill it as well as the surrounding

tissue, which becomes covered with a gummy exudation. When the buds, which have survived the autumn attack, open in the spring the young leaves arising therefrom soon show the characteristic brown spots. The affected areas dry up and fall, leaving the 'shòthole-like' perforations in the foliage so familiar to all growers of stone fruit. The spread of the disease is usually arrested as the warmer weather sets in, but, when rain continues to fall during the early summer months, as has been the case this season, the spores produced during the spring germinate and great damage is done to both fruit and tree. In many cases practically the whole of the tree is defoliated, the crop lost, and, the trees being seriously weakened, sometimes die. That has been the case with cherry trees in many parts of the hills during the present year. Seeing that infection takes place during the autumn and again in spring, the time to spray to successfully combat the disease is apparent. Professor Ralph E. Smith carried out experiments in 1906 in Californian peach orchards covering some 2,500 acres with very gratifying results. The fungicide used was mainly Bordeaux mixture, made in the proportions of 30lbs. bluestone and 35lbs. quick lime to 200 galls. of water. The results of those tests showed that the shothole or peach blight was effectively controlled where the trees were sprayed in October, November, and December (equivalent to our April, May, and June). Where the trees were sprayed in the early spring time only the curl leaf fungus was checked, but the shothole fungus was not affected; consequently he recommended two sprayings, one in the early autumn to control the shothole, and one in the early spring to check the leaf curl. Where possible early pruning is advocated, as the spraying of the trees is made much easier, but the spraying should not be delayed to finish the pruning, otherwise the season for successfully dealing with the disease may pass. Bordeaux mixture is not the only fungicide that can be used against this trouble, as any reliable spray recommended for this type of disease should give satisfactory results. Burgundy mixture (bluestone and soda) has given the best results in our local tests against the leaf curl fungus, and is more easily applied than the Bordeaux mixture. It is interesting to note here that in a publication 'Insect and Fungus Pests of the Orchard and Farm,' by A. M. Lea, F.E.S., &c., issued by the Council of Agriculture, Tasmania, the fungus disease (*Podosphaera oxyacantha*) which sometimes is very destructive to nursery stock and to the young shoots of bearing apple trees, especially New Yorks (Cleopatra) and Stone Pippins, is termed powdery mildew, or 'fire blight.' The cabbage aphis (*Aphis brassicae*).—This insect often plays havoc with cruciferous plants during the summer and autumn months. It is of a dull greenish color, but is covered with greyish mealy substance, which is easily rubbed off. It usually occurs on patches on the leaves, and the soil beneath the attacked plant often becomes greyish with the secretions given off by the insects. When badly affected, the plants have a very disagreeable odor, which can be detected some distance away. Thousands of specimens may be observed on a single leaf, and reproduction is so rapid that were it not for useful insects, which keep them in check, the growing of cabbages and cauliflowers would be a difficult task. The most useful of these insects is a small ichneumon fly. When attacked by this fly the aphides lose their soft downy appearance, and turn to a dark straw color and become somewhat shiny. When examined closely, a small hole in the body of the aphis may be seen through which the parasite has escaped. The best preventive against infection is to keep the plants growing rapidly, because stunted plants are more liable to attack. The application of manures to the soil before planting, and the watering in of small quantities of nitrate of soda, sulphate of ammonia, and soot as the cabbages are commencing to heart will force the plants on and thus aid in preventing attack. The spraying with water at 120deg. Fahr. is recommended where the aphides have become established. Pour boiling water into the spray tank, and by the time it is sprayed on to the plants it will not be too hot, and will not injure the cabbage leaves, since the thick fleshy nature of the leaves enables them to withstand considerable heat with very little damage. Spraying with tobacco wash, resin wash, or kerosine emulsion will destroy the insects, but these applications should be applied before the cabbages begin to heart, otherwise the vegetables may become tainted. As many of the plants become infested while still in the seed bed, it is advisable to immerse the young plants in one of the above spray mixtures when transplanting.'' Mr. J. Turner had found that cabbages inclined to be a little open were more often attacked by the aphis

than those of the solid heart type, and recommended Drumhead and Brunswick varieties for summer growing. He had checked the pest by applying water and wood ashes to the affected plants. Mr. P. H. Williams did not favor spraying, but preferred to water freely to keep the cabbages growing fast in order that the plants should not be checked in their growth.

GRADING FRUIT.—In reply to the question, "Is it worth while to grade fruit for sale in South Australia Mr. G. W. Summers stated that the graded fruit always commanded the best price, because the buyer based his price upon the smallest fruit he saw in the case. When dealing with the question "Whether the growers of this district could by co-operating and grading the fruit obtain more satisfactory results by obtaining orders, and delivering the fruit direct to the consumer," he said if the whole crop could be disposed of in that way it would pay, but if part only were dealt with the packers would refuse to take the remainder. There would be a greater consumption of fruit by selling at a fair price by the case than there was now with the hawker selling out the produce in one or two-pint lots. There was too great a difference between the grower's price and the hawker's price. If the hawker sold at a smaller profit more fruit would be disposed of. The only way would be to establish a central depot. Mr. Ashby contended that there was no fear of being boycotted by the buyers, who would come to where they could buy reliable fruit. A great deal could be done by co-operating and putting up the fruit in small packages and getting the retail shops, other than fruit shops, to act as the vendors. By these means the fruit could be placed within reach of the consumers in a form and at a price which they have never previously experienced. To deal with apples and pears in that way was a simple matter, but the handling of soft fruits presented more difficulties, which might, however, be easily overcome.

At a meeting held on January 15th Mr. F. E. Place, the Government Veterinary Lecturer, read a paper entitled "Some Common Ailments of Cows," and afterwards answered a number of questions.

CYGNET RIVER.

January 4th.—Present: nine members.

SIDE LINES ON THE FARM.—Dealing with small holdings of 50 or 100 acres in extent, Mr. F. J. Wakelin, in a paper on side lines on the farm, said that on such an area a living could not be obtained from cereals, but sheep were profitable if hand fed, and every farmer should have a few, if only to breed from. The first move would be to enclose 25 or 50 acres with a sheep proof fence and divide it into two paddocks, so that the sheep could be changed from one paddock to another. If the grazing were fairly good, 50 sheep would do well on such an area for three months without any hand feeding. During the rest of the year hand feeding would be necessary. Good oaten chaff was the cheapest food, and the sheep did well on it. Poultry was another profitable line if given proper attention. The best laying hens should be selected and penned up for breeding purposes. No other than the best should be bred from. It was better to keep 20 good laying hens than 50 old hens running about the yard scratching out feed and hay and eating their heads off. Laying hens should not be overfed, but should be made to do plenty of scratching for their food. Mr. H. T. Noske urged that there was more profit in sheep at the present time than when they could be purchased at one-fourth the present price. Mr. N. Brennand considered that a few sheep should be kept on every farm, but it was essential to fence before commencing.

HARTLEY (Average annual rainfall, 15in. to 16in.).

December 6th.—Present: 12 members.

MANURES.—By way of preface to a paper on the subject of manures Mr. S. Bearis dealt with the question of plant growth and then, in regard to manures, mentioned that calcareous substances such as lime, shells, and gypsum not only had a mechanical effect on the soil, but also supplied elements necessary as plant food. One of the constituents which frequently needed to be supplied to plants in manure was phosphoric acid. That was supplied by quite a number of phosphatic manures, and one of the most valuable was bones, either ground or crushed into a powder or

meal. Bones were often dissolved in sulphuric acid, by which means the phosphate of lime became soluble in water, and thus supplied plant food immediately to the soil. Common manure consisted of the remains of organised bodies of every description, whether animal or vegetable, in a state of decomposition, *i.e.*, resolving themselves into those elements which could re-enter into the vegetable system. Manure, which had not completely undergone the process of fermentation so that the straw was not wholly decomposed, was best adapted to strong compact soils, rendering the soil lighter, and on the completion of the fermentation of the straws, etc., the temperature of the soil was very considerably raised. Those substances which were subject to the most rapid decomposition were specially valuable for manure—they were animal manures, which require no chemical preparation to fit them for the soil. The farmer, however, should have some knowledge of how to blend them in order to prevent their too rapid fermentation. Reference was then made to various substances which were used as manure in parts of the more thickly populated countries.

A Few Hints on the Farm.—Mr. W. Bermingham read a paper entitled a few hints on the farm, in which he declared that it was a mistake to use long-pointed shares in the stiff, stony land in that district, because the plough had to jump so high that it missed too much ground. The short T shares were better, and they were better still when an inch or so had worn off them and they had been sharpened up again, which should be done by the farmer himself, because no one knew how a thing should be done better than the user. A paddock on the side of a hill should be ploughed up and down, because much more was done than if ploughed the other, since the plough was always running on an angle, and that meant taking less than a full furrow. It was contended that ploughing across the hill was easier for the horses, but that was doubtful, because any implement running at an angle was not pulling easily. After being ploughed the ground should be cultivated or harrowed crossways at once to keep the water from running off. What was desired was that every drop of rain should be absorbed where it dropped. That was impossible in some places, but more could be done in that respect. Water running over the land did no good. It set the soil down tightly, and that was not what was required. When harrowing after the drill, it was best to harrow with a view to stopping the water from running, because in trickling down the harrow tine marks it would soon wash out little creeks. The same thing applied to the grass paddocks. Tons of water ran into the creeks which could be kept on the grass by a little foresight. Much could be done with a shovel by turning the tricklings off in different places and putting a good coat of stable manure across the little gullies, or super. might be drilled in with a hoe drill. That would make a good coat of grass which would hold the water fairly, and pay well for the super. used.

INMAN VALLEY (Average annual rainfall, 26in. to 27in.).

January 11th.—Present: 14 members.

Dairying.—"First of all ascertain if the land is suitable to dairying," advised Mr. E. Hutchinson in a paper on dairying, or, he continued, the result would be failure and loss. Second and third class land should be avoided, the guiding principle being the best cows on the best land. An 80-acre section should carry 10 cows, or eight acres to the cow, with a horse or two for general purposes. Each cow should average 260lbs. of butter per annum, which at 1s. per lb. equalled £13 per cow. Cows should be yarded for milking in an enclosure having a post and rail fence, the size depending on the number of cows dealt with. No barbed wire should under any circumstances be used on a dairy farm. Bails and leg ropes should be used according to the temperament of the cows. The bail should be 10ft. x 5ft., and 6ft. 6in. in height, with a slab or stone flooring. A dish of clean water and soap should be provided to wash the milker's hands and the cow's udder, and a shovel should be kept to remove any droppings at once. The milking should be done at regular hours, twice a day, except during the drying off process. Cows should be yarded at least 15 minutes before milking, and should never be driven with a dog. Animals which were difficult to milk or had lost a quarter should be dried off and fattened for the butcher. Three months before calving the cow should be dried off. Twelve hours after the calf had been dropped it should be separated from the mother and tied up so that she could see it, for a week, and

then removed, if necessary. Generally the milk from the cow should not be used until the fourth day after calving, but in the case of a heifer it should be six days. At eight years the best had been got from a cow, though they would sometimes last until 12 or 14 years. In that district during the cold winter months there was a considerable decrease in the cow's butter yield, and therefore shelter should be provided in the shape of a shed, pine trees, a straw stack, or scrub lands. In feeding cows, if water were plentiful, lucerne should be available from February 1st to May 1st, but otherwise a ration of bran and chaff (20lbs. of chaff and one gallon of bran mixed with water) should be supplied twice daily. From May 1st to August 1st green feed should be supplied. A pure Ayrshire bull should be secured at a cost of from 30 to 40 guineas, but it was inadvisable to stint money in procuring a good animal. Each cow should be tested, and none but the best kept. Several members condemned the suggestion that the calf should be allowed to remain in sight of the newly-calved cow. It was contended that the sooner the calf was placed out of sight and hearing the sooner the mother forgot it.

LONGWOOD (Average annual rainfall, 37in. to 38in.).

January 6th.—Present: 10 members and four visitors.

Potato Culture.—After tracing the history of the potato and its introduction to England and Ireland, Mr. Joseph Johnson, in an informative paper, dealt with its cultivation. Firstly, he insisted upon the necessity for having the land in good condition before planting. The beds should also be harrowed when the potatoes were coming up, which would assist in destroying the weeds and render hand hoeing almost unnecessary. The distance between setts was important. Pinkeyes, Up-to-dates, Carmens No. 1, and Excelsior rows should be from 22in. to 24in. apart x 1ft. Snowflakes, Prolifics, and Carmens No. 2 required more room. Space and ventilation were required in potato growing. That was demonstrated by the fact that where a sett missed the roots on either side were usually the best. Early planting in a wet season, such as the present, should be as shallow as possible, not more than three or four inches, but later in the season it should be four or five inches, but at any time the planting should be rather shallow than deep. Deep planting frequently caused irregular crops. The best potatoes were always found near the surface, a fact which indicated that deep planting was not required. Cut setts always gave the best results for spring planting, and the size depended upon the number of eyes. A sett of about 2in. was sufficient and two good eyes were ample. In some varieties, one eye, if well shot, was sufficient. If seed were not ready to plant, it should be kept out of the ground until it was ready, with the result that the crop would mature earlier and probably better. Round seed from a poor crop should never be planted, and seed continually saved from round could not give good results. At all times, a change of seed was desirable, and, if possible, imported seed should be used. He would like to emphasise that there was a great difference between seed potatoes and potato seed. Seed potatoes were those saved from potatoes which had grown in the land, but potato seed was found in the tops, but only in beds which had bloomed well, under favorable conditions. It was from that seed that new varieties were obtained. Much time was required to raise plants from seeds, but they usually possessed more vigor, greater yielding powers, and were less liable to disease than varieties grown from the same tubers for many years. Varieties tended to deteriorate, and although the deterioration was greatly retarded by frequent change of seed and good cultivation, it was advisable to constantly experiment with new varieties. In favorable seasons, on good potato soil, well tilled and manured, crops of 12 to 16 tons per acre might be grown. Early potatoes were more liable to disease than those grown later, but spraying at the proper time had proved to be a preventive of disease. Potatoes would grow anywhere, but were more prone to contract disease in stiff than in light soil. The most prolific varieties for early planting were Manistee, Bismarck, Up-to-date, Carmen No. 1, Pinkeyes, Scottish Triumphs, and Excelsiors. For late planting, Up-to-dates, Snowflakes, Sussex, Wellington, White Prolific, and Carmen No. 2 were best. He emphasised the necessity for greater care with seed before planting. Seed should be obtained a month or two before planting and placed on trays or lofts with plenty of ventilation. Galvanized iron cases made good trays. The bottom boards should be removed, and a sufficient number replaced to allow a free passage of air. The

trays could be stacked one on top of the other, but in such a way as to allow plenty of room between. Seed given plenty of ventilation and allowed to harden before planting would become more healthy, and was less liable to rot or take disease when planted, whether the season was wet or dry. Seed saved from a crop dug just before it was fully matured would yield better results than those left in the soil after the tops had dried off. In taking seed out to plant, boxes should be used, because in that way the shoots were saved and heavier crops obtained. The manure required depended upon the crop previously grown on the land. Where cabbage, cauliflower, lettuce, peas, and such like had been grown to perfection, very little manure would be necessary, but it would always pay to give a light dressing of potato manure. If the land was not rich, up to 10cwts. per acre of such manure might be given. There was, of course, nothing like stable manure. Most of the land was deficient in lime, and if lime were applied it should be done when the land was being prepared for planting, and not at the time of planting. Drainage was an important factor in the production of good potatoes. Where the land was not of a porous nature artificial drainage, that was underground drains, should be constructed. Ploughed furrows were too shallow for drainage. The drains should be 3ft. or 4ft. deep. Clay pipes were best, but rather expensive. He had found that slabs 18in. in length made excellent drains. Discussion ensued, in which it was stated that the first essential to success was the thorough and deep working of the soil. Stable manure might be ploughed in, but artificial manures were best if spread on the surface after planting and harrowed in. Eight hundredweight of potato manure was equal to 10cwts. of bonedust per acre. If potatoes were planted on hillsides nitrogenous manures should be used. From potato seeds it required three seasons to obtain results. From 50 seeds one or two good sorts might be obtained.

Orchards and Orchard Work.—Mr. C. H. Beaumont's second paper on orchards and orchard work was read as follows:—In regard to drainage, I recommend that a plan of the intended orchard should be prepared, and one of the uses that the plan can be put to is the placing of the drain pipes. If the plan is drawn as it should be, on a sheet of strong paper with a linen back, set out with a good set and T square, and inked in with Indian ink, and, of course, drawn to scale, there would be no difficulty in deciding on the proper course for the drains. I have but little to say about surface drains for flood waters. Flood waters, from outside, will be prevented from entering the orchard by being diverted, and if it is necessary, flood waters within the orchard must be prepared for by digging a trench large enough to more than carry the water. Those trenches should be lined with stone. The "drainage" I want to emphasise is the soil drainage, by which surplus water in the soil is removed by the drains, instead of having to wait until it is evaporated. Drainage prevents a stagnation of soil water, which means avoidance of the exhaustion of the oxygen from the air in the soil water, and in the spaces in the soil not occupied by water. It is an acknowledged fact that abundance of free oxygen in the soil is a fundamental necessity to plant life, and thorough drainage secures this. There are several effects arising from drainage, which help materially in getting healthy trees, viz., the soil is better ventilated, because it is more open; it is warmer, because the rain is always warmer than the soil, and it carries the heat down with it. The drained soil to a depth of 12in. is 5deg. to 6deg. warmer than undrained, and this means a lot in the winter months, because the growing season is lengthened and the soil can be better cultivated. The available soil moisture is increased, because the roots can go deeper than in undrained soils. We can go on to drained land almost at once after heavy rains, without puddling the soil. Trees require a moist soil, but cannot grow well in a wet one. The water which makes a soil moist is that which adheres to the individual soil particles, in the shape of a thin film, which entirely fills only the smaller spaces between the particles. This kind of water is called capillary, and will move in any direction by capillary attraction, and plants probably depend entirely on this for their supply, and its maintenance is of the greatest importance. A wet soil is caused by gravitational water, which moves in one direction, downwards, and which must be removed, or the trees cannot do well. The roots of the trees require air, just as do the parts above ground, and if all the space is filled with water, air cannot exist there, nor can the bacteria which live in the leguminous plants get their nitrogen; hence, again, is demonstrated the necessity for thorough ventilation. Drained soils dry deeper, and the roots will go down to greater depths. Apple roots have been found 9ft., grapes 6ft., raspberries 5ft., strawberries 22in., and in lucerne 174 days old roots were down 4ft. In

wet soils, as all know, trees are invariably shallow rooted, and are easily damaged in the process of cultivation, and especially if a dry spell sets in. Make sure of this fact—drainage does not rob the soil of necessary water; it helps to conserve that, but it gets rid of excess or surplus water, which would drown the trees' roots by causing the soil to become waterlogged. Some will probably say, "What about the cost; how are we to pay?" That I cannot enter into in this paper. What I am setting out to do is to demonstrate the best way and the most payable way to start an orchard, and I can prove that drained lands are the most payable. And now, how to go about the construction of the drains. The first thing to do is to fix on the outlets, one or many, according to the land. A creek bank is, of course, the ideal; otherwise start from the lowest spot or spots, and mark out on the plan the system it is intended to install. The drains should be between the rows of trees. For fine or clayey soils, the depth of the drain should be 30in., and the distance between about 40ft. For porous sandy or free soils, the depth should be 42in., and the distance between about 80ft. The actual lay out of the drains is difficult to advise on; each lot of land will require special study. But, as a general guide, I would say, if near a creek, run all the lines straight into it; but if the outlets are limited, then the lines will probably be laid out like the backbone and ribs of a fish; but whichever style is used, the principle is the same. If there must be a main, then it must be of larger area than the side drains. A drain 24in. deep will drain only half the area of a 48in. drain in the scheme. The first systems of drainage recorded were in France, in the year 1600, and tile drainage was introduced into England in 1800. Drains are formed by digging trenches to the required depth, placing in them some material which will allow a free passage for the surplus water, and filling in the soil again in such a manner as not to cause obstructions to cultivation. The first material used was the end of branches of trees. I have myself used wattle sticks, and found them answer very well. Then drains of planks were made, sometimes square and sometimes V-shaped, and with holes bored in them. I know of some of those drains in South Australia. Blocks of peat, with holes bored to form pipes, and stones, especially rounded stones, were extensively used; but, surpassing all, is the tile or porous pipe drain. There is no special need for the tile to be porous, but it must be straight. Tile drains are cheapest in the end, because they are practically everlasting, and if placed at proper depths, do not give any trouble. I recommend that tile drains should be installed. If a ready outlet can be secured, a 2in. pipe will drain up to 500ft., a 3in. pipe will do 1,000ft., and so on; thus, if there is one length of 1,000ft., 500ft. of 3in. would be used nearest the outlet, and 500ft. of 2in. in the higher land. If the lay out scheme includes several mains, dig the main trench 4in. deeper than the side drains, and use a 4in. tile or pipe in it. Just let the side drains come in on top of the main. No junctions are necessary. Start all drains from the outlet, and keep a general fall throughout, being of necessity guided by the contour of the land; but no flat places must be allowed, or silt will accumulate. The lowest possible fall is 3in. in 100ft. For those who can afford to do so, I would recommend that they ask a surveyor to lay out the lines and give the grade; but most gardeners will get all they require with a good level and three or more "boning rods" or T's, made 3ft. high, with a 12in. cross piece of 3 x 1 timber. The first three cuts of the trench can be done with a plough. Then is used a narrow long-bladed spade to the depth, the actual bottom being cut with a hoe, shaped half round. With this the grade is completed, and the trench is ready for the tiles or pipes. Start laying the tiles from the outlet, which must be placed so that there is no possibility of its being overgrown or silted; it must be kept constantly clear, and must be protected from breakage; a bit of iron pipe is advisable if procurable. See that the tiles are clean and straight. Do not use a curved one at any time. Lay them close up to each other, and drop a bit of tarred paper on top at the joints. The final tile will, of course, be blocked. A piece of broken tile makes a good finish. In soils liable to silt the pipes, the terminal end may be brought above ground by means of a piece of galvanized downpiping. This is used as a means of testing which subdrain may have become blocked. In filling in the soil, the plough will be used, care being taken to send the subsoil in its proper place. Heap up the top soil, and it will soon sink to its level, and the surface will present an unbroken appearance. If a diagram of the water level in a drained patch of land could be obtained, it would be a series of curves like waves, the deepest part being at the drain, and the shallowest midway between the drains. A point I have not mentioned is that soils of a salty or alkaline nature are benefited considerably by drainage, and in course of time the injurious salts

are removed. To be successful, irrigation must be assisted by drainage. The water removed by the drains enters from under, and gets easily into the tiles at the joints. The use of the tile drain is becoming more extended every year, and in many districts there is no thought of establishing an orchard before the land is drained; and it pays. No one knows better than the members of the Longwood Branch of the Bureau the effect of a waterlogged soil. Some locations do not require drainage, but they are few and far between, and have a natural system, and generally will serve as a demonstration of a successful property. In preparation for planting the trees should be ordered from the nursery months ahead of planting time. Having the plan drawn up will simplify marking out. I recommend that a number of stout wattle sticks or stringybark seedlings be placed at the end of each row. First set out the outside rows; drive down a stake at the spot each tree is to occupy, well into the ground; be careful of the measuring, 20ft. squares between trees is about right. Set out the middle rows, then the centre of the divisions, and then it will be easy to complete the whole filling in. Dig a hole around the stakes, about 3ft. in diameter, 12in. in depth at the outer edge and 6in. at the stake. With a bar shake up the subsoil. Get the holes out as early as possible in the season; the more weathering the soil gets the better. If able to, go for trees to the nursery; choose a nursery, if possible, which has soil similar to that to be planted. Choose trees with a single stem and a good root system. Make sure that they are worked on right stocks, and have no disease. Clear them of weeds, and then get home and heel them in—that is, put their roots in a trench and cover then with moist earth, each lot at the end of the row it is to occupy. When examining the trees at planting time, cut off any broken roots; put the tree in position, the roots to go as near as possible as before lifting, but taking special care to keep one of the strongest roots towards the prevailing wind. Separate the fine roots, and keep them in their proper layer; press the earth firmly around the roots with the foot, and fill in the remainder of the soil. Tie the stem of the tree to the stake with a loose loop, and cut of at about the height of the knee. The time to plant is any time in winter, that is if the land is drained; but do not go on in the heavy rain. Personally, I like to start as soon as the nurseryman can lift the trees. If compelled to continue until spring time, it may be necessary to water the trees several times; but I would sooner leave them in the nursery than plant too late. Do not plant too large a block of one variety—that is to say, if planting Rome Beauty (or any other sort), do not have more than two rows in one place; put another sort in the next row, because some sorts require other special sorts to fertilise them; but I cannot go into this question now. Do not plant sorts which are liable to destructive diseases, such as "bitter pit," &c. It will depend on the available market what sorts should be planted, but it is not good to plant too great a variety. If it is intended to depart from the sorts in general use, pay a visit to the Government Experimental Orchard, Coromandel Valley, and inquire if they have a record of the sort selected. Such a visit will probably be helpful, and may avert serious loss. A select list of trees can be obtained from the Department of Agriculture, Horticultural Branch, Adelaide. I know that the subjects I have dealt with are open to discussion, scarcely two gardeners think alike on the matter; but I have not given anything that I have not seen borne out in practice, or have gleaned from some work of standard value.

MOUNT BARKER.

December 6th.—Present: 51 members.

Fodder Crops.—In detailing his experiences with land in the district, Mr. John Craig, in a paper on fodder crops, said that he had tried many experiments with his land, without success. Then he observed that his tenants had only ploughed to a depth of 3in., and that their crops came up well, but failed after reaching a certain stage. Some of the plants which he dug up showed a cramped characteristic in their roots; therefore he determined to plough deeply and use 1cwt. of bonedust to the acre. The result was quite satisfactory, the land yielding 2 tons of hay to the acre and 60bush. of Algerian oats. Finding that the native grasses were only available for three months in the year, he tried to improve his pasture land by obtaining a grass which would adapt itself to the conditions, and be an improvement on the native fodder. He put in two acres of lucerne on a light, gravelly soil, without manure. It happened to be a good season for lucerne. There was not a great showing, but it was a distinct improvmeent. He also tried

clover and cocksfoot, and had good results. The cocksfoot grew in tussocks, however, and it was difficult to cut for hay; therefore stock were turned into it, and in two years it had gone. Prairie grass did well for two years, and then died out. He tried almost every kind of grass, with varying success, except red clover, which did really well for three years. Unfortunately, the bumble bee was required to fertilise the red clover, and as that insect did not exist in South Australia, the plant did not seed, and had to be resown occasionally. Bumble bees were plentiful in Tasmania and New Zealand, and red clover thrived there. It was a splendid fodder plant, and stood cutting in the same way as lucerne. He had tried paspalum and rye, in conjunction with lucerne, but they both failed. Altogether he had planted 80 acres with various grasses, and the result was that instead of carrying four or five head of crippled cattle, he had 50 head of stock in the pink of condition, and he had transformed what had been a useless section into valuable pasture land. The manures he had used had been, at first 1cwt. of bonedust per acre; but when that became too expensive, he used 2cwt. of guano, and it answered well. Every alternate year he used 1cwt. of grass manure. Although much might be learned from those who had gone before, individual experience was best. Every farmer should endeavor to find some fodder plant which would improve his pasture land, and thus serve a useful purpose for the district and the State.

MOUNT BARKER.

January 3rd.—Present: 37 members and two visitors.

Feeding and Breeding Poultry for Egg Production.—The man in charge must be an enthusiast, premised Mr. E. Beythien, in a paper dealing with the feeding and breeding of poultry for egg production, and he added that sound practical knowledge and experience of feeding and breeding for egg production were essential. He emphasised the word practical, because theory was a rotten stick to lean upon where egg production was concerned. When he used the word poultry, he meant White Leghorns, because, in his opinion, they were the only fowls worth troubling about. There were many methods of feeding laying stock, but it was advisable to study local conditions and work accordingly. Although there were many advocates of the dry mash system, after a series of trials and experiments, he personally preferred wet mash, because he had always got the most satisfactory results from it. Dry mash might be labor saving, but birds certainly appreciated wet mash more; and, another thing, they always seemed to be bigger, brighter, healthier, and in every way more vigorous when reared and fed on the latter. He always fed mash in the evening, but he had only decided to do so after closely watching results of trials, which plainly showed that mash was the main egg-producing food. It was in that form that extra meat meal could be fed if required, oil cake, sunflower, linseed, or crushed oats, and maize could be added, sulphur or Epsom salts could be given—in fact, mash could be composed of not only bran and pollard, as most people thought, but also of any and every necessary food stuff required for body wear and tear, and also for heavy egg production. Besides that, it was in a form more easily digested and assimilated than when the bird was packed with hard grain at night. Heavy grain feeding was a relic of the days when show birds were bred, and tight-feathered bodies were required. Some poultry writers advocated heavy grain feeding at night, especially on cold nights, because they said the grinding in the crop promoted warmth. That was not so. Food easily assimilated without much bodily exertion always promoted far greater body heat, and it was just on the amount of energy necessarily wasted in assimilation that the value of a food stuff was rated high or low, as the case might be—that was, of course, all other things being equal. A bird, well nourished by day, never felt the cold at night; Nature provided against that. In experimenting, he went further, and after dividing a flock of pullets, full sisters of the same age, into four pens, two pens were fed mash twice a day, morning and evening, but only as much in the morning as they would clean up quickly, with full and plenty at night, and a light feed of grain to make them scratch, and plenty of green feed was given at midday. The other two were fed mash once a day, as usual. The trial lasted five months, from April 1st to August 31st, that was through the winter months, and he found that birds fed wet mash twice a day laid a shade over 20 per cent. more than the others. That settled all arguments for him; but as wet mash entailed too much labor where a big commercial plant was concerned, he looked for a method of feeding whereby as much mash as possible could be packed into a bird

in one feed. He found that that could only be done, without injurious results, by feeding it in the evening. If birds were overfed wet mash in the morning, they found the nearest shady tree and slept it off, eventually becoming over fat, lazy, loafing sluggards, and the egg yield fell off accordingly. Whereas, if a light feed of grain were thrown in litter in the morning, with abundance of green feed at midday, the birds were actively scratching all day, and worked up a grand appetite for the evening meal of mash, when they could pack their crops tightly with egg-producing food, so easily digested and assimilated that they slept comfortably all night, and awoke next morning as keen as ever for the grain in the litter. To get the best results in egg yield, a pullet or hen must be kept up in condition, and must therefore be encouraged to eat heavily of rich foodstuffs. The appetite should be stimulated to the fullest extent possible, without actually overdoing it and bringing on indigestion. The droppings should be watched for the danger signal in that regard. Someone once wrote that "any healthy, normal, well-fed hen could be depended upon to show a good egg record." That was to a certain extent true, but it was also very misleading, and that was just where "breeding" came in, for unless breeding and strain were behind the bird, in most cases, no matter how healthy a bird might be, good food would be wasted on it, from a commercial point of view. The best of feeding could only induce a hen to lay to the limit of her capacity. Therefore a man must start with good stock birds, bred for generations for heavy egg production, and only with those that had reached full maturity and were healthy, vigorous, and of stout constitution. It was an open question whether the parent birds would transmit their good qualities to their sons and daughters generally; still, if both sire and dams were known, a close watch could be kept on the progeny, and which matings were satisfactory or otherwise decided. The daughters of good layers, even when mated to sons of good layers, would produce a fair percentage of inferior birds, which should be watched for and culled out from any future breeding pen. Like produced like, only with certain great reservations. It was generally acknowledged that it was to her sons that a heavy layer was most likely to transmit her good qualities; therefore, when mating up, the greatest care should be taken in selecting the male birds. Only sound, vigorous, and well-developed specimens that had reached maturity should be chosen, for it was through breeding from immature stock, especially when related, that heavy chicken mortality, small eggs, weedy stock, and low egg yields could almost always be traced. Immaturity in breeding stock was likely to bring about damage to the flock that would take years to rectify. The only way to know the stock and the breeding that was behind it was to practise line breeding; and he had found that line breeding, carefully carried out, had brought about no degeneration of the stock during the past six years on his own farm. Rather had the stock improved in size, type, and egg production; but the breeders were carefully selected and well matured. In-and-in breeding was often practised without true regard to vigor, constitution, and maturity, and birds were selected simply with a view to heavy egg production. That was, pullets that had laid heavily during the first year were selected on that score only. A man who did this was looking for trouble, and after a few years would surely find it. For it was then that a strain was said to run out, and, of course, inbreeding was blamed. There had been many instances of that locally. Such a result did not come from close breeding of related stock, and it had never been proved that inbreeding, pure and simple, was the cause. It had been proved, times out of number, however, that breeding from closely related and immature stock would bring about that result. All stockbreeders, whether of birds or animals, knew that inbreeding was essential if good qualities were to be perpetuated. Therefore, they should be careful to use only well-matured, sound, healthy stock, that was known to possess strong constitutional vigor, in the breeding pens. The sons or daughters of the heaviest layers should be chosen if they had those qualities.

SANDALWOOD.

January 6th.—Present: nine members.

Dairying.—Dividing the subject into three heads, namely—(a) Stock, (b) feeding and milking, (c) buildings and treatment of produce, Mr. Oakshott, in a paper on dairying, proceeded to say, under the first head, that the cow should have good length and depth in the body, including the couplings, showing the

capacity of the animal to turn large quantities of food into milk; general refinement of form in head, neck, withers, and limbs; good development of udder and milk veins; constitution, as shown in broad chest, much width through the heart, a full, clear, eye, and an active carriage; downward and outward sprung ribs, open spaced and covered with soft pliable elastic skin; triple wedge shape, increasing width from withers downwards, from shoulders backwards, and in top and bottom lines backwards; head medium to fine, clean cut, and relatively longer, lighter, and more dished than the big breeds, eyes prominent and lively, forehead broad and dished, horns fine, ears medium and active; neck longish, light, and almost slim, fine at the junction of the head, and widening, deepening, and opening gradually; back straight as far as the pelvic arch, spinal column well defined, forequarters lighter than the hindquarters, and spare with narrow withers, brisket wedge-shaped, arm inclined to be light, barrel long and paunch-shaped, flanks fairly well filled in front, hind flanks thin, but not sunken, hindquarters long, wide at the top of the hips and coming well down without fullness, hips not heavy, thighs inclined to be tight, and more or less incurved, tail not coarse, tapering, of good length, and hanging at right angles to the back; udder long, broad, and deep, extending well under the belly, and well up behind the tail, evenly quartered, well let down, but not pendulous, with the skin hanging in loose folds behind when the udder was empty—it should be fine, elastic, and not fleshy, veins well defined, hair soft and sparse, teats medium in size, squarely placed on and pointing slightly outwards; milk veins should be large, tortuous, and preferably branched; legs medium in length, fine in bone, straight, and fairly wide apart, and yet well under the body. "The bull is half the herd" was a well-known saying and true. The dairy bull should be stronger in bone, more masculine throughout than the cow, especially in head and neck, with an absence of beefiness in body and limb. He should come from a good butter-producing stock, and the dam and granddam, on both sides, should have good milking records. It was particularly important that his pedigree should show no mongrel blood, or hereditary taint either in constitution, temper, or disease. He should have easily traceable milk veins along the lower line of the belly; plenty of skin along the rear parts of the underline; embryo teats large, distinct, well placed forward, and wide apart; testes well formed in the scrotum, of equal size and visible from behind; a good, healthy, flexible skin; low-set body; a good temper and gentle disposition. He should be open behind, with spare thighs, and it should be ascertained that he was prepotent. The best cattle for pure dairy purposes were Jersey, Guernsey, Ayrshire, and Holstein, but in that district the dual purpose breed (*i.e.*, beef and milk) was most useful. Of those breeds, the Shorthorn was quite the best. In pure stock, at two years the weight of a steer should be from 1,200lbs. to 1,400lbs., at three years 1,500lbs. to 1,900lbs. Heifers, at three years, should be from 1,300lbs. to 1,600lbs. Shorthorn milk should average about 3.80 per cent. of fat, and solids not fat about 9 per cent. Another breed that would be useful in the mallee country was the Kerry, because they were hardy, with robust constitutions, were small feeders, and would live and do well on coarse feed, where other breeds would die. They would produce butter at a lower cost for feed than any other other variety. Their average yield of milk was from 3galls. to 4galls. per day—test about 4 per cent. They were small, but the meat was of good quality, and they were easily fattened. The Kerry cattle made a splendid cross with the Shorthorn. In regard to feed and milking, natural green grass or lucerne was the very best feed for dairy stock, but, for a large part of the year that was not to be had, and hand-feeding was necessary. For that purpose ensilage was the best. Ensilage could be made from any crop, preferably from maize; but that was out of the question in that district. Crops suitable there were barley, wheat, oats, rye, and perhaps sorghum; in fact almost anything in the way of green herbage could be used. Mixed crops were good, such as barley and tares, or oats and tares, if tares could be grown. Ensilage needed other things with it for the best results, such as lucerne chaff, bran, copra or linseed cake, etc., about 40lbs. ensilage with 10lbs. lucerne chaff and 5lbs. cake or 8lbs. bran making an excellent daily ration for a cow in full milk. Rock salt should be available at all times, and plenty of fresh water. Even when grazing it was a good plan to give the cow a small feed at milking time, because it kept her quiet and contented and she then gave the best results. The milking times should be as nearly 12 hours apart as possible, and care should be taken to adopt cleanliness in milking, as in all dairy operations. The udder should be washed with warm water before milking, and a gentle, firm

rubbing of the udder with the hands had a soothing effect on the cow, and would often make the milk come more freely. One person only should milk a cow, and quietness and gentle handling always paid. Dogs should never be allowed near milking cows. Any excitement would reduce the next yield of milk. The first few jets of milk should be drawn off separately from each teat, and it was well to remember that the first milk was poorest in quality, and the last strippings were the richest. That was one reason for stripping a cow quite dry, and another was that it encouraged her to produce greater quantities. The buildings should be large, airy, and cool, flyproof, and well ventilated, for stale, offensive air, such as was met with in damp underground cellars, very soon spoiled cream or butter, because there was nothing which absorbed a smell or flavor as quickly as milk and its products. When possible, cement floors, laid so that they could be well washed down frequently, were the best both for the dairy and the milking bail. Plenty of clean fresh water should be used both for the dairy and for the utensils as well as for washing the butter itself. Separating was best done with the milk at the same heat as when it left the cow, viz., 98deg. F. When separating was only done in the morning, the night's milk should be brought up to that temperature. As soon as the separating had been finished, the cream should be put away in a cool place (if it could be cooled first, so much the better), and kept at a temperature of 55deg. or 60deg. F. Medium thick cream was then ready for churning in 48 to 56 hours. Thick cream took longer, and thin cream a shorter time to ripen for butter-making. It was very important to turn the separator at the pace set out by the maker. If worked more slowly cream was lost, and a lot of milk would get in the cream; if worked at a faster rate, the milk had not time to separate properly, and ran out with the skim. The churn should be scalded out before use, and then rinsed with two lots of cold water to ensure it being well cooled down. All wooden utensils used should be treated in that way, and then rubbed well with salt to prevent the butter sticking. The speed for turning the churn depended on the make of the churn and on the temperature and condition of the cream. Under varying conditions the butter-maker would know better than the maker of the churn. Cream for churning should not be more than about 53deg. F., as a higher temperature meant that some cream would go off in the buttermilk. To ensure the least possible waste, the butter should not come in less than half an hour. If, while churning, the cream became too thick to circulate properly, cold water should be added, but not enough to make the cream too thin. When the butter began to form in tiny pieces the size of a pin's head, the churning should be stopped and all the cream from the sides of the churn washed down with clean water about 45deg. to 50deg. F. Then the cream should be churned again until the pieces were about the size of No. 5 shot, when the butter should be washed until all the buttermilk had been removed. All the water should be drained off, and from ½oz. to ¾oz. of salt per pound worked in, the larger quantity being used for butter which was to be kept any length of time, say for export. The butter was better if left in a cool place to drain before making up or boxing. Coloring could be used, and if so should be put in the churn with the cream. In washing all dairy appliances lukewarm water should be used first, and then hot water with soda (½ per cent.), and finally scalded out with steam or boiling water. The utensils should then be turned up on a bench, where they would dry of their own heat.

STRATHALBYN (Average annual rainfall, 19.28in.)

January 9th.—Present: 14 members.

WHY ARE OUR HILLS NEGLECTED?—Taking this question for a title, Mr. W. H. Cuming read a paper, in which he referred to the area of land along the Commonella Creek, which rises 10 miles west of Strathalbyn and, after winding its way through some splendid hill and flat country, flows into the Angas River at Strathalbyn. There were fewer people on the area referred to at the present time than there were 50 years ago, he said. As to the producing capacity of the land, if it were cultivated in a workmanlike manner, drilled in May, at the rate of 1bush. seed and 100lbs. of super., 30bush. of wheat to the acre would be assured. Yields of 60bush. of oats were common. Early sown peas did well; potatoes could be grown in winter and spring on the slopes of the hills, and on the damp flats in summer and autumn. Fruit and vines, especially currants, did well; and in

addition, vegetables. Experience had demonstrated that the district was particularly healthy for livestock, tick being the only difficulty with sheep, and that could be overcome by dipping the animals after each shearing. He concluded with the opinion that the strip of country under notice was capable of carrying three times the population at present, three times the number of stock, and it should yield ten times the amount of produce. Mr. Cuming tabled a number of samples of fodders and vegetables by way of emphasizing his opinion.

BLACKHEATH, January 6th.—Mr. R. W. Rolland read a paper on wheat carting, in which he urged the use of a van in that district instead of a wagon because of the long distance it was necessary to travel, and the journey could be completed more quickly with a van and a team of four or five horses. Wagons and lorries were unsuited to sandy country. A van of about 17cwts. could be used on the farm for all classes of work, and with a double brake and fairly wide tyres could carry a load of 40 bags of wheat.

CHERRY GARDENS, January 2nd.—Mr. C. Ricks read a paper entitled "Some Reasons Why Our Young Men Leave the Country for the Towns and Cities." The paper had been previously read at the Hills Conference.

CLARENDON, November 6.—Mr. H. C. Harper read a short paper on weeds that trouble the farmer, in which he urged that if, when noxious weeds made their first appearance, farmers took the trouble to eradicate and destroy them, they would save themselves much trouble and loss.

KANMANTOO, January 6th.—After discussing the best method of exterminating foxes, it was resolved that all farmers and settlers throughout the State be urged to commence poisoning foxes about March 24th, and to continue operations until the end of April. It was pointed out that, if only a few lambs in each district were saved, it would be well worth the trouble considering the present price of sheep.

MACGILLIVRAY, December 5th.—A paper was read by Mr. H. E. Petras, on foals. He expressed the opinion that a foal should be handled early, probably at weaning time. It should be caught with a lasso, the rope passed around a post, and the foal allowed to pull as much as it wished. After some pulling the lasso should be taken off, a rope fastened around the neck, and the foal tied to a post, where it could make a complete circuit. The rope should have a play of not more than 2ft., and should be adjusted so that the animal could not get its feet entangled. After standing for an hour it would be easy to make the foal follow on the rope. Foals treated in that way were really half broken. Mr. H. D. Inglis and H. C. Williams agreed as to the advisability of tying up foals. Mr. A. J. Nicholls and Mr. R. Wheaton preferred to leave the handling of the animals until they were broken in.

MILANG, January 13th.—In the course of a free parliament, Mr. C. W. Ness said that last season he had used Dorset Horn and Shropshire rams, and his experience had been that although the Dorset Horn lambs appeared to be bigger and heavier than the Shropshires, when put in the scales the Shropshires were invariably the heavier. Mr. S. H. Goldsworthy said that he found oats far better than chaff to feed to ewes in lamb.

SOUTH-EAST DISTRICT.

MUNDALLA.

December 18th.—Present: seven members and one visitor.

OATS VERSUS WHEAT.—Taking oats as the hay crop, Mr. J. E. Staude, in a paper discussing the relative merits of oats and wheat, said that he preferred oats to wheat, because a heavier cut could be relied upon. Land which was sick of wheat

would produce a good crop of oats. Horses would do more hard work on a diet of oaten chaff than on a diet of wheaten chaff. There were diverse opinions as to the proper stage at which to cut for hay, but, in his experience, when cut green it was inclined to be bitter, and stock did not eat it readily. He preferred to cut for hay on the ripe side, and following closely behind the binder stook it at once. If large round stooks were built properly it required a good deal of rain to damage the hay. He had known hay well stooked to be quite fresh when opened up after three or four inches of rain. Only the outside sheaves were slightly discolored. The objections to using wheat for hay were that if cut on the green side the color was nice and fresh, but there was no strength in the feed. If cut on the ripe side it was too heating, and horses were more liable to suffer from sore shoulders than if fed on oaten chaff.

NARACOORTE (Average annual rainfall, 22.60in.).

January 13th.—Present: 17 members.

ADVANTAGES OF EDUCATING CHILDREN IN ELEMENTARY AGRICULTURE.—The underlying suggestion at the back of educating children in elementary agriculture was that those elements should be inculcated chiefly by the schools, remarked Mr. C. J. Jenner, in a paper on that subject. But of course, he continued, the parent or employer would be frequently pointing out to those under his charge, if they happened to be on a farm, illustrations of the principles of agriculture as they arose. Two reasons made the question a national one—(1) The importance of the nation's food supply being maintained; and (2) the lack of abundant coal supply in Australia generally, and particularly in South Australia, which must retard the States in regard to manufactures. For that reason, apart altogether from the complex industrial problems which confronted them, South Australia's prosperity must depend, for the present, largely on its wool and wheat production. It was important, therefore, that the coming generation, especially those living in the country, should have its attention turned to agriculture. A large percentage of the boys in country schools would ultimately settle on the land, and it would be of great value to them if their mental activities should be bent early towards the land, in order that they might enter upon their responsibilities with some clear understanding of the principles which made for success. It was not so much a question of the amount of information imparted, as of the thought provoked. If an energetic lad, with tendencies towards agriculture, could be stimulated to think of the possibilities of properly cultivated land, and be given fair scope, his future was assured, whether he devoted his attention to growing grain or fodder or to raising horses, cattle, sheep, or pigs. It all depended on a few elementary principles, which, to some extent, could be pointed out and experimentally illustrated at school. Early and correct thinking must lead to greater efficiency, which was the clarion call of the day in all businesses. The tendency of the times was towards intense culture, and the greatest success must flow from following scientific principles. If the lad at school had been taught the elements of agriculture, that thought was instilled into his mind, and it might be that labor considerations would lead to the working of smaller holdings, in which the problems of intense culture would occupy a prominent place. Agricultural training taught the children to observe cause and effect. All teaching should be of an experimental character, and careful records should be kept. The "how" and "why" of things should be constantly before the pupil, and the course he would recommend would be as follows:—1. Soil—Origins of soils; kinds of soils and their characteristics; inorganic and organic elements in the soil. 2. Plant life—Kinds of grain crops and uses in production of flour, meal, hay, alcohol, etc. 3. Other crops—Sorghum, peas, lucerne, and their values; germination, relation of soil and air, influence of light (heat and moisture), selection of seed. 4. Tillage—Meaning and purposes of trenching, ploughing, fallowing, dry farming. 5. Diseases—Kinds of diseases, avoidance of diseases, purpose of pickling, etc. 6. Manures—Kinds and uses of manures, rotation of crops. It seemed to him that more use ought to be made of the Agricultural College, and perhaps the high schools could be utilised in developing agricultural education on a scientific basis. Mr. C. Bray said that the paper was interesting and scholarly. Mr. A. Johnstone did not believe in the primary school hours being taken up in such subjects, which could not be taught properly in school hours, and it was only wasting time to attempt it. There

should be a separate department for imparting such knowledge. Mr. W. E. Rogers, though not quite agreeing to the teaching of agriculture to the children, considered that a great deal of knowledge of agriculture could be imparted at school which would be useful in after life. Mr. F. A. Holmes believed that if agriculture, in an elementary form, were taught in the schools it would be useful in after years. Mr. S. H. Shinckel held that it did a boy good to know something of agriculture, and it would encourage him to cultivate little things which would beautify his home if he did not follow farming in after life.

KONGORONG, January 2nd.—Mr. T. Dixon read a paper on lucerne growing, in which he urged its advantages as a fodder for stock generally, especially dairy stocks. For five years he had grown lucerne around his homestead, and since last July had taken five cuts from it. He had sown the seed in August, about 3lbs. of seed being used on a quarter of an acre patch, and he had applied stable manure once. Mr. F. Kemp said that the roots of lucerne went down very deeply. Mr. E. E. Morrison was of opinion that lucerne would not do on wet ground. Sandy loam was better than stiff soil if there was a clay bottom. Irrigation was necessary to secure the best results. It was also well to inoculate with the necessary bacteria. Mr. W. A. Aslin recommended commencing with a small patch, and then extending it. Mr. C. S. McLean had seen lucerne flourish on 6in. of soil next to limestone. Mr. C. Kemp said that 4ft. of soil above clay was required.

LOCKJAW.

Lockjaw, or tetanus, is a poisoning of the great nerve centres by material produced by the bacillus *tetani*. This germ is present in all soil, but only becomes active in the animal body when in a wound to which there is only a limited access of air. In an ordinary way an antidote is produced in the blood, and the bad effects prevented. When, however, this is not produced in sufficient quantity to counteract the poison produced, the symptoms of the disease appear. Nature cures a large number of cases by this method. Prevention is assisted by the use of a serum which increases the activity of the preventive substance, but this is of little use once the disease is established. The free use of Epsom salts, 6ozs. to 8ozs. of which will be sucked up by a horse daily, so alters the blood that the poison is broken up, and if started early enough is a safe method of treatment.—FRAS. EVELYN PLACE, B.V.Sc., M.R.C.V.S., in reply to a correspondent.